MODERN MECHANICS

AND INVENTIONS

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SEE PAGE 52

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by FRITZ VON OPEL

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MODERN MECHANICS AND INVENTIONS

VOL. III NO. 6 PRICE 25 CENTS

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APRIL, 1930

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Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minn.

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Thank You for Mentioning Modern Mechanics and Inventions for April When Writing to Advertisers

They Told Him Salesmen Were "Born"

But Now He Makes $10,000 a Year ...Thanks to This Little Book

IT was just a little free book that made the difference between Ed Pinkham and the rest of the men in our shop. Nobody ever imagined that Ed would land, even in the $5,000-a-year class, let alone be making $10,000 before he was thirty. Ed didn't know himself the abilities he had in him as a money-maker.

But one day, a strange occurrence changed his whole life. During his lunch hour Ed started to read a little book he had brought to work with him.

"It's a book called 'The Key To Master Salesmanship,' Bill," he told me. "It's the most amazing thing I ever read. I never dreamed there was so much in salesmanship. You ought to send for a copy yourself. It's free."

"Huh!" said Luke Jones. "Does that book tell you how to become a salesman?"

"It sure does," replied Ed, enthusiastically.

"Don't waste your time," advised Luke. "You can't learn how to be a salesman. A fellow has to be 'born' that way to be a good salesman."

Ed just smiled at that, but he said nothing. Soon afterward he quit the shop, and we forgot about him. And then last night, I met Ed again—driving a snappy new sedan and dressed like a million dollars.

"For Pete's sake," I said. "What are you doing nowadays, Ed?" He smiled. "City salesmanager for the Steel Castings Company," he told me. "What are you doing?"

"Still at the shop," I replied. "But what I want to know is, how do you come to be salesmanager for Steel Castings? They're one of the biggest firms in the business."

Ed smiled again. "Remember that book on Salesmanship that Luke Jones was kidding me about one day? Well, when I finished my Salesmanship training the Association I took it from gave me a choice of twenty-two jobs through their Free Employment Department, and I took a position as salesman for Steel Castings Company. They made me City Sales Manager three months ago at ten thousand dollars a year."

"Good night!" I said. "And Luke and I are still punching the old time clock!"

Ed looked at me seriously. "See here, Bill," he said. "Are you sport enough to risk two cents that you can do as well as I did? Then spend the two cents to write to the National Salesmen's Training Association tonight and get their free book. Then take their course. When you have your diploma, their Free Employment Department will help you get a good sales job—every year they have calls for over 50,000 salesmen. Not only will they help you get the job but they give you an iron-clad money-back guarantee that you must be satisfied with the training received—or they refund your tuition!"

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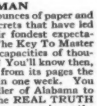

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Cover Design Painted by Stewart Rouse

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—L. L. Cooke

I Will Train You at Home to fill a Big-Pay Job!

L. L. COOKE
Chief Engineer

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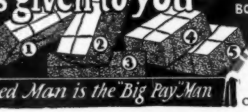

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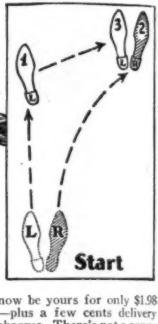

I DON'T care how poorly you dance now. I don't care if you've never been on a dance floor in your life. If you can do the simple step pictured at the right, I'll send you my complete famous course in dancing—for 5 days' *Free Trial.*

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And dancing is great fun—wonderful exercise. It takes your mind off your worries and cares. Keeps you happy and healthy—always on your toes and full of pep. Develops poise and self-confidence—enables you to make friends easily—and often opens the door to important and social contacts.

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This is the kind of training that quickly puts men into the high salaried jobs—or into profitable contracting businesses of their own. Yet now you get it right at home in only 2 or 3 months. It requires no extensive education. If you can read and understand what is written here you can easily master it.

See what this training has done for others: Bartholomew, Calif., became a contractor at an increase of over 300% his first year; Blair, Okla., stepped up to Superintendent at 100% increase; Dickerson, R. I., increased his salary 700% in 12 months; Marchand, La., says: "My income has increased 200% and I now have more contracting work than I can do."

Over seven billion dollars will be spent this year in new construction! No wonder then, such tremendous opportunities are open to you when you have this "head-work" training in Blue Prints! If you want more money—real big money! Then choose a "Blue Print" job in Building. Clerk or Salesman, Carpenter or Bricklayer, here is the one field where there are limited opportunities for advancement.

So accept my FREE gift of a complete set of real working Blue Prints, and my fascinating Book "How to Read Blue Prints" that tells all the interesting and instructive facts about Blue Print Plans. Don't send one penny—pay no C. O. D.—It's all FREE. Just fill out and mail the coupon today—NOW!

TWO BOOKS also FREE

IF YOU LIVE NEARBY Visit our big day or evening school attended by over 1000 Builders. You can get the same training at home by mail—same plans, lessons and instructors. Your spare time is enough.

Chicago Technical School for Builders—Dept. D-163, Chicago Tech. Building, 118 East 26th Street, Chicago, Ill.

Please send me your free book, "How To Read Blue Prints," and complete set of real Blue Prints I understand these are mine to keep without obligation. It is also understood that no salesman will call on me.

Name .....

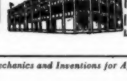
Address .....

City ..... State.....

Age ..... Occupation.....

Chicago Technical SCHOOL for BUILDERS

Dept. D-163, 118 East 26th St., Chicago, Ill.



Step into BIG PAY this New Way through DRAFTING

COME on you fellows who are sick and tired of lay-offs, job hunting and poor pay work. Say goodbye forever to hard times and starvation wages. Become an Engineering Draftsman and land a fine paying, year 'round job through the now famous L. L. COOKE "See it — Do it" Method — the amazingly simple quick-action Training that's getting sensational results for men like you everywhere. It's new, it's thorough, it's complete — said to be the first real improvement in Drafting instruction in 30 years — and you don't have to be a High School graduate nor a master of figures to learn it and learn it right.

Only Spare Time At Home Needed — Complete Drawing Outfit Furnished

Just give a little of your spare time to this wonderful training and you'll be surprised how rapidly you make progress. With this amazing "See it — Do it" Method and the Big Complete Drawing Outfit that comes with it you start at once to do Drafting just as it's done in the great Drafting Rooms everywhere — you begin immediately to get the knowledge and the skill that employers demand and pay Big Money for — your advancement is fast and steady — and almost before you realize it you're ready for a fine job in work that pays $50 to $100 a week and more.

SIMPLE THOROUGH PRACTICAL

It's just as easy as it looks in these pictures. You learn by DOING. Actual pictures of your instructor's hands guide you. You SEE IT done — and you DO IT yourself. The pictures show you HOW and the text tells you WHY. And you learn about mechanical shop practice and everything a Draftsman must know. It's just like actually working in a Drafting Room with an expert instructor at your elbow every minute showing you what to do and how to do it. No wonder it's so intensely interesting, so thorough, so quick!

Step by Step YOU SEE IT

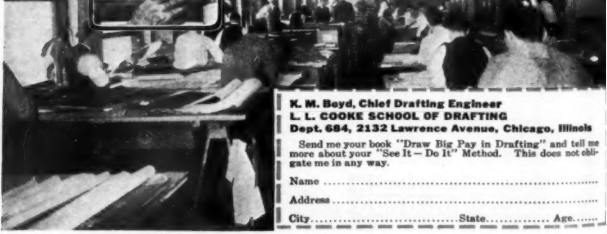
The pictures in this ad show you how easy it now is to learn Drafting. But these are only 5 of the 27 fine drawings and pictures in Job No. 13. And the whole Training is worked out so expertly and clearly that you make real progress right from the start and advance rapidly.

K. M. BOYD

Act today to increase your pay

Step by Step YOU DO IT

Make up your mind to get into Drafting. It's your Big Opportunity for Big Pay. But don't sign up for any Course until you've learned all about this highly-simplified "See it — Do it" Method. Mail coupon for Big FREE Book. Read all about this wonderful Training and what it has done for other men like you. See the Big Outfit of Draftsman's Tools and Complete Drawing outfit given without extra charge. Read about the Earn-while-Learning Plan, the Nation-wide Job Service and the great Money Back Agreement. Mail the coupon right now.



K. M. Boyd, Chief Drafting Engineer
L. L. COOKE SCHOOL OF DRAFTING
Dept. 684, 2132 Lawrence Avenue, Chicago, Illinois

Send me your book "Draw Big Pay in Drafting" and tell me more about your "See It — Do It" Method. This does not obligate me in any way.

Name .....

Address .....

City ..... State ..... Age .....

Learn ELECTRICITY

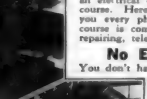
and in 90 Days

You Can Get a Big Pay Job

Get into this profitable profession. Get into Electricity where there is always an insistent demand for your services at highest pay—$50 to $150 a week. Learn to master the magical "juice"—the power that puts and keeps the universe in motion. I will teach you by the simple, practical personal instruction method. For many years I have been training men by this **Shop Plan System** which has proved to be the most successful method for making well trained electrical experts. Many of my graduates are now earning $50 to $150 a week and if you will put your future in my hands I'll prepare you to earn that much.

No Books---You Learn on Actual Machines

You learn on real electrical equipment, with real tools. My Special School Shops are fitted with Switch Boards, Generators, Motors, etc. You get first hand knowledge of A. C. and D. C. Armature Winding, House Wiring, Splicing, in fact everything you need to know to become an electrical expert. I also give you complete instruction on Automobile, Aviation and Radio Electrical Systems and Batteries.



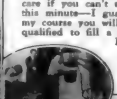
Complete Course in RADIO

I'll Train You the McSweeny Way

I don't believe in books or printed lessons, or dry lectures. I believe in the practical shop way. I want every McSweeny Graduate to be an electrical expert, and that's what he becomes when he finishes my course. Here I put you into the very heart of electricity. I teach you every phase from A to Z—alternating and direct currents. My course is complete—Installation, substation work, motor and generator repairing, telephone, telegraph, and radio electricity.

No Experience or Education Needed!

You don't have to have any special previous education or training, to grasp my simple method of instruction. You don't even need to know anything about electricity now. I don't care if you can't tell a motor from a horse-and-buggy this minute—I guarantee that when you have finished my course you will know electricity thoroughly and be qualified to fill a big pay job. And if you are not, I'll refund every penny of your tuition.



Guarantee Satisfaction

If, after completing my training you are not 100% satisfied and are not qualified to fill one of the big pay electrical jobs, I will refund every cent of your tuition.

Mail the Coupon

That's your next step right now. It will bring you my remarkable low tuition offer and also full details of how you can master this highly paid profession and in a few short weeks be ready to land a real job at real pay. Learn why you will like my school—why fellows say it's more fun than work to train the McSweeny Way. Start now to better yourself. Act at once. Mail this coupon for my famous Big Book — sent FREE. J. H. McSweeny, President.

(Write to Nearest School)

McSWEENY ELECTRICAL SCHOOLS

Dept. E-14-W, 1815 E. 24th St., Cleveland, Ohio
Dept. E-14-W, 263 Madison St., Memphis, Tenn.

Mail Coupon for My Big FREE Book and Special Low Tuition Offer!

Mail This to Nearest School

Mr. J. H. McSweeny, Pres.,
McSweeny Electrical Shops.
Dept. E-14-W, 1815 E. 24th St., Cleveland, O.
Dept. E-14-W, 263 Madison St., Memphis, Tenn.

Dear Mac: Without obligation send me a copy of your big free book on ELECTRICITY; also details of remarkable tuition offer and complete Radio Course.

Name .....

Address .....

Town ..... State .....

R. T. I. R. T. I. QUALIFIES YOU TO MAKE MONEY AND ITS SERVICE KEEPS YOU UP-TO-THE-MINUTE ON THE NEWEST DEVELOPMENTS IN RADIO, TELEVISION AND TALKING PICTURES R. T. I.

GOOD JOBS *Right at Your Finger Tips*

WHEN YOU ARE R.T.I. TRAINED IN

RADIO-TELEVISION - *Talking Pictures*

BIG PAY JOBS! SPARE TIME PROFITS! A FINE BUSINESS OF YOUR OWN! They're all open to you and other live wire men who answer the call of RADIO. The fastest growing industry in the world needs more trained men. And now come Television and Talking Movies—the magic sisters of Radio. Will you answer this call? Will you get ready for a big pay job Now and step into a BIGGER OWN later on? You can do it. EASILY NOW.

FRED H. SCHNELL
Chief of R. T. I. Staff
Twenty years of Radio Experience! Pioneer in establishing two-way communication between Police Cars and Central Traffic Managers of Electricity, Radio Equipment Manufacturers and U. S. Navy. Inventor and Designer Radio Apparatus. Consultant and Radio Engineer in charge of R. T. I. Radio Training — and you will like his friendly manner of helping you realize your ambitions.

R. T. I. Home Training Puts You in This Big Money Field

Radio alone, pays over 200 MILLION DOLLARS a year in wages in Broadcasting, Manufacturing, Sales, Service, Commercial Stations and on Board the big sea going ships and many more men are needed. Television and Talking Movies open up other vast fields of money-making opportunities for ambitious men. Get into this great business that is live, new and up-to-date, where thousands of trained men easily earn $60 to $100 a week—where $10,000 a year jobs are plentiful for men with training plus experience.

Easy To Learn At Home—In Spare Time

Learning Radio the R. T. I. way with F. H. Schnell, the "Ace of Radio," behind you is EASY, INTERESTING, really FUN. Only a few spare hours are needed and lack of education or experience won't bother you a bit. We furnish all necessary testing and working apparatus and start you off on practical work you'll enjoy—you learn to do the jobs that pay real money and which are going begging now for want of competent men to fill them.

Amazingly Quick Results

You want to earn BIG MONEY, and you want some of it QUICK. R. T. I. "Three in One" Home Training—Radio-Television-Talking Movies—will give it to you, because it's easy, practical, and is kept right up-to-date with last minute information. In a few weeks you can be doing actual Radio work, making enough EXTRA MONEY to more than pay for your training. In a few short months you can be all through—ready to step into a good paying job or start a business of your own. A BIG JOB—BIG MONEY—A BIG FUTURE. There is no other business in the world like it.

Investigate—Send For R. T. I. Book Now

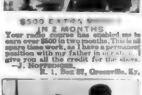
Don't waste a minute. Find out what the great Radio industry, which has grown faster than the Automobile and Motion Picture business, has to offer you. Find out exactly what other men are earning. SEE HOW EASILY YOU CAN GET STARTED. Get the facts about Radio, Television and the Talking Pictures, firsthand, in the big R. T. I. FREE BOOK. Learn what this R. T. I. "Three in One" Home Training can do for you. Mail the coupon for FREE BOOK Now.

RADIO & TELEVISION INSTITUTE
Dept. 6S
4806 St. Anthony Court Chicago

R. T. I. TRAINED YOU AT HOME FOR A GOOD JOB OR A PROFITABLE PART TIME OR FULL TIME BUSINESS OF YOUR OWN R. T. I.

R.T.I. *Training Brings Big Jobs Like These!*

$500 EXTRA MONEY
IN SPARE TIME
Your radio course has enabled me to earn over $500 in two months. This is all spare time work, as I have a permanent position with my father in our shop. I give you all the credit for the above. —J. HOFFMANN, R. 1, Box 81, Greenville, Ky.


NEARLY $25 A DAY
I make as high as $25.00 per day and have made $250.00 in 2 months from Radio work. That's not all but when I'm only 19 and in a small town. You did all you said you would and much more. —FLOYD KEMP, R. 1, Box 61, St. Joe, Ind.

GALAXY RADIO U.S.
Built my Radio Service Business for me. Galaxy Radio Co., distributors for Howard Radio Receivers in Oklahoma, and Texas Panhandle, with an increase in gallery of about $1,000 since I enrolled with your school. —EARL F. GOSNEY, 618 E. 6th St., Oklahoma City, Okla.

RADIO & TELEVISION INSTITUTE
Dept. 6S 4806 St. Anthony Court, Chicago

Send me Free and prepaid your BIG BOOK "Tune In On Big Pay" and full details of your three-in-one Home Training (without obligating me in any way).

Name .....

Address .....

City ..... State .....

The illustration at the left shows a group of students in Parks Airplane and Engine Mechanics School receiving instructions on the new tri-motored Ford monoplane which has recently been added to the Parks fleet of more than 30 planes of varying size and type.

Like a University Degree

A DIPLOMA from the Airplane and Engine Mechanics School of Parks Air College brings you immediate returns. It is proof positive of your ability. For the aeronautical industry knows *by gratifying experience* that Parks-trained mechanics are experts—thoroughly competent to handle any job in the factory or on the flying line. The Parks course for mechanics is unequalled anywhere in the world, just as Parks flying courses are without a peer. Every subject is taught systematically—*thoroughly*—conscientiously. Every operation is performed under the supervision of instructors such as only a great institution like Parks can obtain—and with the *finest and most elaborate machinery money can buy.*

Every Parks course, too, is under the close personal supervision of Oliver L. Parks, whose fame as unquestioned leader in the field of aviation instruction is international. That is another reason why *Parks* training means *best* training—why a diploma from Parks gives the same definite prestige to its holder as a university degree.

In its affiliations, too, Parks Air College offers its graduates more opportunity for employment than any other training school in America. As a division of the Detroit Aircraft Corporation it is a member of an organization that includes five of the finest aircraft factories in America. They are manned—and will continue to be manned—by Parks mechanics! Another assurance of the future of the Parks-trained man!

The coupon on this page will bring to you the fullest information about Parks and its courses.

Get it in the mail RIGHT NOW—and we shall send you "The Man Who Tunes the Plane", a vivid, interesting picture of the mechanic's highly profitable place in aviation.

Don't forget the coupon is your ticket to a new viewpoint on aviation—to an hour of absorbing reading—to success in the newest, most fascinating and best paying of the world's great industries.

Parks Air College was one of the first to be licensed by the U. S. Department of Commerce as a fully accredited transport school.

PARKS AIR COLLEGE

(Division of Detroit Aircraft Corporation)

480 Missouri Theatre Building

ST. LOUIS MISSOURI

COUPON

PARKS AIR COLLEGE,
480 Missouri Theatre Bldg., St. Louis, Missouri

Without cost or obligation to me, please mail your illustrated catalog.

Name .....

Street address .....

City ..... State .....

Aeroplane Drafting Room Blue Print

Copy This Sketch and Get Aeroplane Blue Print Free

FREE!

I Train You In Your Own HOME

Learn to be an aeroplane designer. I will train you RIGHT IN YOUR OWN HOME. Here's your opportunity to get into the big money earning branch of Aviation—Designing aeroplanes. Copy the aeroplane picture shown here and mail to me with coupon below. If I think you show talent for this work and really want to train for a big pay position in aviation, I will mail you direct from my drafting room an aeroplane blueprint in three views with all main parts named and explained.

GET INTO AVIATION

through the Front Door—the Drafting Room

LEARN AERO-DRAFTING

Aero Drafting Experts In Big Demand

THESE PAY-MAKING TOOLS FOR YOU!

FREE →

Pay-Raising Plan

Write today for this book which has started hundreds of men—many with but little education and no experience on the road to success. Learn about the drafting instruments I furnish my students without extra charge. And all the other features of my training. Write today.

If you want to fit yourself for a start toward making big money in AVIATION—get into the creative end of this rapidly growing industry. There are good aeroplane designers today who get $12,000 a year—*think of it*—**$1,000 a month.** Let me train you in Aero-Drafting—and put you in line for a position like this—Remember, *you don't need flying or mechanical experience* to become an Aero-Draftsman.

Former Factory Helper Raises Income to $7,000 a Year

A. H. Bernier of Detroit, Michigan—one of my students had a factory job at $12.00 a week when he enrolled with me. After taking my course he was picked from 65 men and made assistant Chief Draftsman.

My Training the Front Door To a Place in AVIATION

No matter what you are doing now—if you can read, write and understand plain simple English and want to get into Aero-Drafting, mail coupon today. Let me show you what I can do for you. See how I train you—at home—by my easy practical method—Learn about my employment service that is free to my students. Copy sketch and mail today!

Engineer Dobe

Mail This Coupon If You Earn Less Than $70 a Week

Get my free books giving all the facts about Aero-Drafting and my training. Read my money back agreement which says you must be satisfied or your training costs you nothing. Make the start to big pay today. Mail sketch. Get Free Blue Print.

Engineer Dobe, Div. 23-54
1951 Lawrence Ave. Chicago, Ill.

FREE Blue Print Coupon

ENGINEER DOBE, Div. 23-54
1951 Lawrence Ave., Chicago, Ill.

I want to get into Aviation through the Drafting Room. Here's my copy of Aeroplane sketch. Send me the blue print and your free books "Successful Draftsmanship" and "My Pay-Raising Plan," all Free to me.

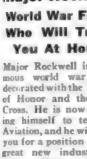
Name ..... *Age* .....

Address .....

Town ..... *State* .....

Major Rockwell Will Train You *Until You Have an Aviation Job Paying $300 to $400 Monthly*

I make this amazing offer, for a short time and to a limited number, to supply the crying need for trained men. Here is your opportunity to get into this uncrowded, fascinating field with a definite certainty of your future.



Major Rockwell
World War Flyer
Who Will Train
You At Home

Major Rockwell is a famous world war flyer, decorated with the Legion of Honor and the War Cross. He is now devoting himself to teaching Aviation, and he will train you for a position in this great new industry as only a Veteran World War Flyer can train you.

In 12 Weeks!

Just devote about an hour a day to my Home Study Course, and in 12 weeks you can be mastering the principles of Ground Training, which are necessary before you take your place in any branch of Aviation. In a few short months I will give you practical aviation training and prepare you for one of the big pay, thrilling jobs open only to men thoroughly trained in Aviation.

No Advance Education Necessary or Experience Needed

You don't need to have a high school or college education to master my course. You do not even need to know anything about airplanes, motors or mechanics. My home course is thorough and complete. Everything is so clearly explained, with easy-to-understand text and pictures, that in a few short months you will be able to grasp every fundamental principle of Aviation ground work and you will be well on the road to qualify for any important aviation job paying $300 to $400 a month. My Home Study Course will give you all the knowledge necessary to pass the government's written examinations for mechanics' or pilots' licenses.

Soloed in 7 Hours

Dear Major: Your excellent advice saved me from taking up Aviation the wrong way when I wanted to learn flying first. After I had completed your ground course, which thoroughly prepared me in the principles of flight, I was able to solo in 7 hours. I always will be glad to tell anyone that I am a Rockwell trained man.

Sincerely, WM. C. BICKELS.

You Learn Principles of Aviation at Home Then Choose Any One of 40 Ground Jobs. ---If You Want Actual Flying, My Home Study Course

teaches you the principles of flight. When you have completed the ground training I will arrange for you to take your flying instruction at any licensed airport near your home at special reduced rates. Or if you want, you can come here to Dayton and get training at one of the finest and best equipped airports in America. No matter where you learn to fly you can qualify for a pilot's license and a high pay flying job in passenger lines, mail service, and other important branches of flying.

Manager of Big Company

Dear Major: The main thing about your individual method of instruction is that you not only gave me a thorough knowledge of Aviation, but you also showed me how to capitalize on what I learned. I am now General Manager for International Air Surveys and making three times what I ever earned before. I will always be a booster for your method of training.

FLOYD PROTHERO.

Satisfaction or Money Back

I am so sure that you can learn Aviation with my help and step into a big aviation job that if you are not satisfied when you have finished my course, I agree to return every penny of your tuition. Act now while my special offer lasts. Rush this coupon to me for a copy of my famous free book.

MAJOR ROB'T L. ROCKWELL
THE DAYTON SCHOOL OF AVIATION
Desk D-31 **DAYTON, OHIO**

Get My No-Risk Plan My Big Book Explains ALL I'll send it FREE

Major Rob't L. Rockwell
The Dayton School of Aviation
Desk D-31, Dayton, Ohio.

Dear Major:—Please send me FREE and without obligation a copy of your famous book on Aviation; also your special tuition and position offer.

Name .....

Address .....

Town ..... State ..... Age .....

"Give me your measure and I'll PROVE that you can have a body like mine"

—CHARLES ATLAS

"The World's Most Perfectly Developed Man."

Check the man you now are—Get my free book that tells how **Dynamic-Tension** can make you the man you want to be

SKINNY?—Add weight—develop a handsome husky body!
LACK STRENGTH?—Add inches of conquering muscle!
HALF-ALIVE?—Get new pep and tireless energy!
ALWAYS AILING?—Discover new through-and-through health!
WEAK-WILLED?—Become master of yourself and others!
TIMID?—Acquire the forceful personality of a winner!

Photo—Our 1929

NECK 17 In.

CHEST NORMAL 46½ In.

BICEPS 17 In.

FOREARM 14½ In.

WAIST 32 In.

CALF 16¼ In.

HEIGHT 5 Ft. 10 In.

WEIGHT 178 Lbs.

YOU, too, can be PROUD of your body! You, too, can be the new man I picture above! I'll tell you the secret of *Dynamic-Tension* that changed me from a skinny, cringing, no-muscle "weak-sister" to winner of the championship title: *"The World's Most Perfectly Developed Man."*

I've helped thousands of others, young and old—fellows who were missing half the fun of life because they lacked the pep and vigor and my kind of a big, powerful, evenly-developed body that puts a man on top every time. If I could help these other thousands, I can help YOU. If they could be turned into "Atlas Champions" *you can, too!*

Dynamic-Tension Does It!

It's easy my *Dynamic-Tension* way. And quick! You get the PROOF in your first seven days—in one week you begin to SEE and FEEL the difference in your bodily condition and physical appearance.

If you are underweight, I'll add the pounds where they are needed and, if you are fat in spots, I'll show you how to pare down to the fighting trim that I am always in myself. I'll show you how to become a man of might and muscle—put a solid inch of smooth, powerful muscle all over your body.

And with big muscles and powerful, evenly-developed body that my method so quickly gives you, I'll also give you *through-and-through* health—health that digs down into your system and banishes such things as constipation, pimples, skin blotches and the hundred-and-one other petty ailments that rob you of the good times and the good things of life.

First, do what my other prize-winning followers did. Send for a free copy of my 48-page book—*"Everlasting Health and Strength,"* by Charles Atlas. Gamble a 2c stamp for the biggest prize that anyone can gain—a handsome, healthy, muscular body that commands the respect of anybody, any time, any place!

With my book I'll send you a confidential chart so that you can give me all your measurements. Then compare *your* development with *mine*. Measure your chest and put the figures beside mine. Do the same with legs, arms, neck, wrist and all other parts of your body—and list the weak spots in your whole system that you want brought back to par. Then get the proof of what my system of *Dynamic-Tension* will do for you—in your own home—spending as little as 15 minutes a day doing what I tell you—without apparatus—without special foods, pills, or baths—without any kind of fussy contrivance whatsoever! Give *me* one week and I'll give *you* the proof!

Remember, it's easy my way. No apparatus—*Dynamic-Tension* does the work. You owe it to yourself to find out what my secret will do for you. Make sure of *your* free copy of my book—mail the coupon NOW. Address me personally—CHARLES ATLAS, (Dept. 64), 171 Madison Ave., New York City.

CHARLES ATLAS (Dept. 64)
171 Madison Ave., New York City.

I want the proof that your system of *Dynamic-Tension* will give me, too, a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength" and the confidential chart for my measurements.

Name .....
(Please Print or Write Plainly)

Address .....

City ..... State .....

Thank You for Mentioning Modern Mechanics and Inventions for April When Writing to Advertisers

I will train you at home to fill a BIG PAY Radio Job!

Here's Proof

$100 a week

"My earnings in Radio are many times greater than I ever expected they would be when I enrolled. They seldom fall under $100 a week."
E. E. WINBORNE,
1414 W. 48th St.,
Norfolk, Va.

Jumped from $35 to $100 a week

"Before I entered Radio I was making $35 a week. Last week I earned $110 servicing and selling Radios. I owe my success to N. R. I."
J. A. VAUGHN
3715 S. Kingshighway,
St. Louis, Mo.

$500 extra in 6 months

"I find I made $500 from January to May in my spare time. My best week brought me $107. I should have taken it long ago."
HOYT MOORE
R. R. 3, Box 919,
Indianapolis, Ind.

If you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It is free. Clip the coupon NOW. Why be satisfied with $25, $30 or $40 a week for longer than the short time it takes to get ready for Radio.

Radio's growth opening hundreds of $50, $75, $100 a week jobs every year

In about ten years Radio has grown from a $2,000,000 to a $1,000,000,000 industry. Over 300,000 jobs have been created. Hundreds more are being opened every year by its continued growth. Men and young men with the right training—the kind of training I give you—are needed continually.

You have many jobs to choose from

Broadcasting stations use engineers, operators, station managers and pay $1,800 to $5,000 a year. Manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers, for jobs paying up to $15,000 a year. Shipping companies use hundreds of Radio operators, give them world wide travel at practically no expense and a salary of $85 to $200 a month. Dealers and jobbers employ service men, salesmen, buyers, managers, and pay $30 to $100 a week. There are many other opportunities too.

So many opportunities many N. R. I. men make $5 to $25 a week extra while learning

The day you enroll with me I'll show you how to do 10 jobs, common in most every neighborhood, for spare time money. Throughout your course I send you information on servicing popular makes of sets; I give you the plans and ideas that are making $200 to $1,000 for hundreds of N. R. I. students in their spare time while studying.

Talking Movies, Television, Wired Radio are also included

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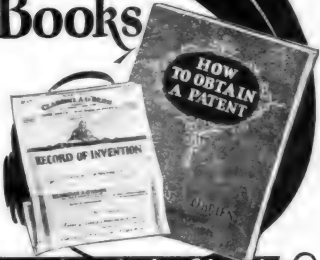

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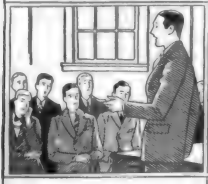

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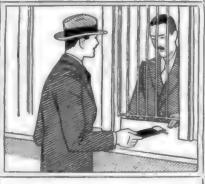

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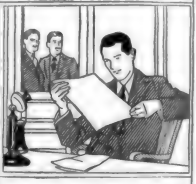

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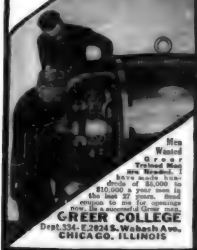

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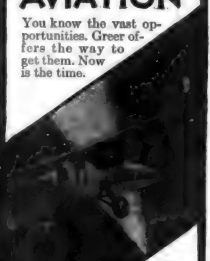

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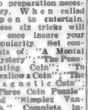

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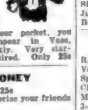

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Aviation Institute of U. S. A.
Walter Hinton, *President*
1115 Connecticut Ave., Washington, D. C.

40

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Walter Hinton

Trail-blazer, pioneer, explorer, author, instructor, AVIATOR. The first man to pilot a plane across the Atlantic—the famous NC-4—and first to fly from North to South America. The man who was a crack flying instructor for the Navy during the War; who today is training farsighted men for Aviation, Hinton is ready to back YOU up to the limit. His book is yours FREE for the coupon below.

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Dear Lieut. Hinton: Send me your FREE Book telling how I can train under you right at home for Aviation.

Name.....

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(Must be over 18)

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This flyin' sweetheart is the new monoplane being built around the four-cylinder air-cooled Gypsy Wright by the Pheasant Aircraft Co. She is a two-place ship with a world of visibility for the pilot.

The SHOP MAIL BOX

If you've got any ideas which you think should be passed on to the editors and readers of Modern Mechanics, send them in to the Shop Mail Box, which is reserved for your particular use. Andy, the Grease Monkey, will see to it that you get an answer.

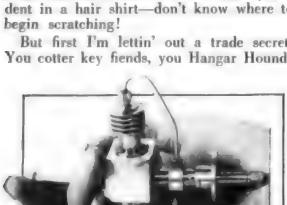
HOITY-TOITY! What a month to be souping up the shop mail box dope! There is so much hot stuff that has just broken as this is being written that a poor feller like me is like a United States president in a hair shirt—don't know where to begin scratching!

But first I'm lettin' out a trade secret. You cotter key fiends, you Hangar Hounds and kite flyers, you camera sharps and dirt track specialists (not to mention the B battery bugs and the model making gentry) may have wondered who the fellow was who was writin' all this hooey an' comment about the editor's correspondence each month. I'll tell you—

It's me!

My name is Andy for short. I've got another one, but it doesn't matter. I'm just Andy, the Grease Monkey at the local airport. I've been workin' near the editors' work bench for so long, and have done so much currying of MODERN MECHANICS' Waco that is used for gettin' the editors around, that I hear everything that goes on, knowin' what it's all about by instinct. That's how this all started.

I'll tell you how it was. One day the editors were getting into their tin goose to cover a story in far parts when I cracks wise about something which they supposes is a secret. One of the factotums says, "Suppose the Duke of Bilgewater here (meanin' me) writes answers to the Gang about what's going on. He reads everybody's mail anyway."



This three-cylinder compressed air motor powers a model airplane with nine-foot wing spread. It weighs six ounces and is ⅜ by ⅜ bore and stroke, swinging an 18-inch prop.

(Continued on page 28)

YOU'RE NEXT

Now Watch YOUR Muscles GROW!

ONE

ONE—two—three! Look at those pictures! They show the three stages in building muscles. They show how a puny weakling may be changed into a physical GIANT when muscles are developed **progressively.** It takes SCIENCE to build muscles like that. And that's why Titus Training has accomplished such amazing results for thousands of men. Titus Training develops **every** muscle in the body. It makes muscles GROW. Step by step it builds them up—makes them bigger and bigger—until your whole body is covered with mighty layers of live, solid **strength.**

Come on, friend, you're NEXT. I don't care how weak or how strong you are now—or whether you're 20 or 50. If you are organically sound, Titus Training will work its wonders for YOU.

TWO

I'll Increase Your Muscles by INCHES

Yes sir, and all I want is 30 days—and just 20 or 30 minutes a day. In that short time I'll put layer after layer of muscle all over your body till they stand out like iron bands. And they'll be panther muscles, friend—muscles as live as spring steel—with the speed of lightning and the power of a battering ram. These are the kind of muscles that make champions, the kind of muscles that will make you laugh at men twice your size.

Wear This Medal

Strung on all over the world wear it. Made of solid statuary bronze and given to you free.

THREE

NOTE: The pictures above are a diagrammatic visualization of the progressive development of the entire muscular system. They typify the results reported by thousands of Titus-trained men, who through the Titus system of progressive development have made their muscles GROW.

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Tear off that coupon! Mail it today! It will bring you FREE the greatest book you've ever seen—a book filled with astounding photographs of men rebuilt—a book packed full of Titus's own secrets of making muscles grow. No cost or obligation—just rush the coupon to Dept. W-149.

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Dear Titus: Sure I'd like to have your book. Send it free.

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More Letters for the Shop Mail Box From Modern Mechanics Fans

(Continued from page 26)

So that's how come. You've seen me incognito before. But now, Gang, I've been allowed to burst forth in all of my exclusive by-lined informativeness. Anything you want to know—jes' ask me. I'm little Andy, the Grease Monk, white, single, 28, ex-army, A.E.F., an' "airplants" ain't my only specialty. From now on this comment is my own, un-edited. What I like I'll give a big hand—an' how I'll pan what I don't! Yessir—tellin' the editors what's ailin', and superintendin' the gobs of good stuff I hear is comin' up.

Now, to look at my bunk over among the oil barrels in the corner of Shank's hangar, straddling as it does my old barnstorming suitcase, which by the way has got *plenty* of hours, you wouldn't think I amounted to much or looked like much.

I don't. Just a rural mechanic with wings. But anyhow I hopped down to Shycowgo the other day and horned in on lots of news and gore pertaining to the mechanical world.

Over at Ed Heath's airplane emporium they're doing things to that well known light airplane called the Super Parasol. The struts come down in a V like a monocoupe now, and the little pint-sized sky buggy has a door in the side of the fuselage! All hippos can now throw away their shoe horns. As an old timer I predict that the present jobs without the doors will be more in favor with the old time type of flyer who exhilarates in the real airplane flavor of things.

BUT say—I've been sounding off enough. Let's let the Gang barge in here for a bit and I'll tell you later about the other stuff I ran my optics over.

Here's a peach from Jerry Blascomb of Washington, D. C.

Dear Gang:

I feel it is all right to address this letter like that. Let me tell you. Here is a new one. Here in Washington Francis Jenkins has a new radiovision set. He uses constant light with a new repulsion valve that cuts off a light beam. It makes pretty good pictures. Why don't you get a story on this for us?

As ever,
Jerry Blascomb.

Well, knowing that Jenkins always has something hot, we arranged for J. Earle Miller, the editing enigma, the galloping globe trotter, to call on Mr. Jenkins, who is a friend of his—result: All the low down on the first real new thing in television in months. Incidentally, radio vision is the term applied now by those in the know. Television is a term implying that the pic has been "piped by wire."

Here is Eagle Scout Chick Reinhart of New Jersey, who hiked to Lawrence, Kansas, and is building a plane to fly home with.

Hola! Get this:

Dear Sirs:

Well, I've got my Alco started and I'm going to fly her home when she's done. I am sending you a shot of one side of the fuselage, and myself. It weighs less than ten pounds. Say hello to everybody.

Sincerely,
"Chick" Reinhart.

Reinhart is a globe trotter from way back. Hitch hiking his way from his home in New Jersey, Eagle Scout Chick Reinhart, eighteen year old aide-de-camp to New York's police commissioner, presented himself last season in the editorial sanctum of MODERN MECHANICS. Great was the surprise of the editors, great the delight of Reinhart as he unfolded his unique plan of going to Lawrence, Kansas, to build a plane and fly it home. Looks like the boy is getting there, eh?

WISH all you chaps who are buzzing with questions about aviation could look over my shoulder at a copy of "Opportunities in Aviation" just sent us by the author, Walter Hinton, who was the first trans-Atlantic pilot and is now president of the Aviation Institute. Mr. Hinton doesn't leave a stone unturned in his book. He digs into those questions everyone asks—Can I learn to fly? How much money could I make

(Continued on page 32)

Thank You for Mentioning Modern Mechanics and Inventions for April When Writing to Advertisers

Minister's 9-Year Old Boy Runs $3 Into "Fortune"

Former Poor Country Preacher Now Reveals Small Son's Secret That Saved Family Home and Brought Prosperity And Happiness. Tells Easy Way For Any Man or Woman To End Money Worries. A Remarkable Story of Dramatic Facts More Thrilling Than Fiction Because It Is Actually True. A Life Drama With A New Kind of Happy Ending That Will Probably Amaze You Because It Shows How You, Too, Can Find The End Of The Rainbow.

As Related

By Rev. C. V. McMurphy.

WITH a sigh of despair Rev. McMurphy thought of the hopelessness of his present situation. Would the new home he had just built for his little family be snatched away from them, he wondered.

How could he ever meet the builder's notes that would soon be due? How could he even earn a living, now that their little car had given out and they were no longer able to travel their district to carry on their ministerial work. The outlook was surely despairing.

Then as swiftly as misfortune had darkened their home, the darkness vanished. And it was his little boy who lifted the shadow. "Daddy," he explained, "I have a wonderful surprise that you don't need to worry any more. I have a way out of our troubles." Excitedly he told his astonished father of an article he had read about the president of a building institution in Ohio who has founded a plan to help worthy men and women out of their financial troubles. Breathlessly he told that he had written this man and he showed his father the reply.

Eagerly Rev. McMurphy read every word of the great deeds this remarkable man is doing for other men and women. He read of the vast interests of this big institution—scattered all over America, in every city, town and village—interests as wide-spread that it is possible to help local men and women in a pleasant, dignified way to end their money troubles for just looking after some of their interests in full or spare time.

"What a generous offer for anyone to make. And how easy and simple, too. The end of my financial worries," exclaimed Rev McMurphy! "Nothing less than I ever made before. What good fortune!"

The possibilities seemed too good to be true. But he became more and more convinced as he read letter after letter from other men and women, some saying that they made as high as $35 and $40 in a single day for just attending to some of this man's interests. Why, he even offers to make a partner in his business of every honest man and woman who follows his easy, simple plan. "How can such a thing be possible?" Rev. McMurphy thought.

Yet it must be true—this man surely must be sincere—he must fill all his promises. For he has nothing to gain unless he does. He asks nobody to take any risks. He won't even let anyone risk one penny buying anything. He just wants you to follow his simple plan.

"Why, daddy," said the boy, "even I can do this easy work and get all this money for you. Let me try—please. Just lend me a few dollars to pay my expenses, daddy." Impressed by the courage and enthusiasm of this 9-year-old child, he realized that here was the answer to his prayers. So he accepted this man's generous offer of help. But he also determined to allow this child to complete his wonderful lesson in courage and faith, to let him go out alone on the first trip.

And the child ran $3 into a fortune. Their future was settled. Their money worries were over. The results of this courageous little fellow's experiment were so amazing that his father wrote as follows:

"My little boy came back in about an hour with profits of nearly $3 00 I said to myself: 'If this child can make that much in an hour, I can make twice that amount.' And I took up the work.

"I assure you I now have no fear of financial problems. The notes on the house have been burned and we have a nice car to ride around in and attend to our church affairs. I am deeply obligated to you for what you have done for me and my home.

"Last Saturday afternoon I went out after 2 o'clock, made $30.00 and was back home before sunset. If all the underpaid country preachers could just learn what a great opportunity awaits them with you there would be fewer long faces from financial problems and more good cheer in preaching the gospel. I thank God for the day that my little boy wrote you, and I thank you, Mr. Van, for the light that led you to my home and family."

* * * *

This true story of Rev. McMurphy's is just an example of the many letters I have received from men and women whom I have helped. Men who could not find employment, widows with children to support, women whose husbands made only small wages, men whose wages were less than they required to live right and who had spare time they wanted to turn into money—thousands like these have turned to me for financial help, and I have put them on the road to prosperity, independence and happiness.

You don't need to be a minister to get my help. No matter what your present work—whether you are man or woman—I will be glad to help you make more money than you ever thought possible. My plan is a funny one. Even some of my women partners have made more money than their husbands.

This whole thing is so simple—so easy—that people wonder how in the world I can afford to do it. But I believe in live and let live. We can't take our money with us when we go. So let there be happiness spread all over on this earth. All I ask any one to do is follow my easy, simple, proven plan. Just spend a few hours a day looking after my interests in your town. Be as honest and fair with me as I guarantee to be with you. And I will show you how to end your money worries.

I will set you up in a business of your own. I will not let you risk even a penny. I will do as much for you as I have for 25,000 other men and women. If $10 a day or more will end your money worries, then I promise to show you how to go after it on my easy plan. And I am known to 25,000 partners as the man who always keeps his promises.

Don't send me one penny for this offer of help. Just write and tell me how much you need. Better still, mail the coupon and start getting this money at once. C. W. Van De Mark, Dept. 2034-DD, Ninth and Sycamore Street, Cincinnati, Ohio.

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Position .....

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Letters from the Shop Mail Box

(Continued from page 28)

at it? What chance has a man in the manufacturing end? What are the dangers? His book is as full as a five and dime. It's published by W. W. Norton and Co., New York, N. Y., at $3 a copy.

And here's another voice to which, even before you read it, we subscribe a hearty "Yea!"

Dear Editors:

When I first saw an edition of your magazine, Modern Mechanics, and saw that you are taking more interest in boats, I could not help but write asking you if you will have the world renowned Gar Wood's boat "Miss America VII" and what type of boats the other models will be. Personally I prefer the hydroplanes and cruisers.

Yours for more boats,

J. Tutak.

P. S. How about something more on radio?

NOT long ago we wrote a glider man in the East for some dope on his gliders. He had cracked up some dandy ships and the club he belonged to were interested in

(Continued on page 34)

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A gold mine of facts can often be converted into a gold-mine of dollars, for builders and only save money but learn how to make more money with the five big books on architecture, carpentry and building. These books enable themselves contractors by learning how to estimate correctly; contractors are able to handle bigger and more profitable jobs by learning how the big fellows do it. Men who want to build homes can save money by learning how it should be done. The new **Jiffy Index** puts before your eyes without wasted time, the things you want to know. Nothing has been overlooked. Use of tools, building construction, heating, lighting, plumbing, architectural drawing; all fully covered. We will include with the five volumes above, at the special reduced price of only $19.80 (easy payments) a handsome book, "Blueprint Reading," 120 pages, full of diagrams, etc., without extra charge.

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I would like to look at the five books described above. Send them to me on your free offer. I will examine them thoroughly and return them in ten days unless I like them. In which case I will send you $2.00 and after that $3.00 per month until the total price of only $19.80 is paid. You are also to send me your book, "Blueprint Reading," without extra charge.

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Letters from the Shop Mail Box

(Continued from page 32)

all types, having built the Duede, the Northrop and the Bowlus sailplane.

His answer was so funny we are having it prepared as a treatise on the trials of a glider enthusiast, and are taking his suggestions to heart about the editing of the original manuscript. We wanted to reimburse him a bit for the letter he wrote, and said as much. Here is his answer which is typical of the friendly, rollicking spirit of America in the air.

Dear Sir:

In answer to your letter dated Nov. 18th, the club needs that $10.00. You can go ahead and make all the alterations you like so long as you correct the spelling in my last letter.

Please add that we have had many successes, as well as failures and also that we have had one big hunk of fun. I will send you the results of our next flights in a few weeks.

With that $10 we can all have a hair cut. Best luck for Modern Mechanics.

Yours,
(President)
Frederick W. Heath.

(Continued on page 38)

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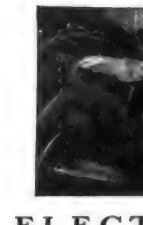

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Age ..... City ..... State .....

Letters from the Shop Mail Box

(Continued from page 34)

HERE are a few morsels for you people out there who like statistics — and we're not telling you that if you lay them all end on end you'll get somewhere, either.

It's about this here Flying Contest of ours. During the third contest one of our figger-minded boys started doping out a lot of little interesting facts regarding you fellows—and girls—that have tried to win your wings. The results of that contest—won by a lad named Slemmer, down in New York—are detailed elsewhere, but here is one thing we've found in going over the entries.

All told there were 4149 letters submitted. In age they ran all the way from a youthful air-minded American who boasted the proud age of 11 to an equally air-minded American of 47. Sixteen and seventeen are the popular ages for collectively they show approximately 20 per cent in the returns. Eighteen, nineteen and twenty-one are next in the order named and pretty well bunched. From then on down they trail off to some 200 entrants who forgot to mention their age on the blanks.

Now take a look at the winners—Slemmer is 36, Lawrence Lewis is 22, and the boy from Texas, Tom Sprague, is the same age as the winning fledgling. They came through this month because their entries, according to the judges, were best. But wait a minute! A little lady of 19 and another of 33 gave these boys a mighty close tussle. So age and sex apparently doesn't mean a thing to win. (Dumas, winner of Number Two, you may remember is 21.)

According to our demon calculator a total of 85,093 years are represented by you people out there who shared in the contest. He goes a bit further in his deductions by saying that on the basis of 4149 contestants, the average age is 20.5. Not being good at figgers we have tried to argue against these but we'll leave it to you to dope out.

Every state in the Union is represented as well as every province of Canada. There are 210 from up above the border and about 32 that came from Honolulu, one from Germany and another from down in Panama. Some 300 girls took part in the party.

Too, this figger-hound sniffed out the fact

(Continued on page 42)

If YOU Were Down and Out

AND I agreed to start you in a big, new, money-making business of your own—RIGHT AT HOME—IN YOUR SPARE TIME—a business in which I have helped other ambitious men and women DOUBLE, TRIPLE and QUADRUPLE their earnings, would you jump at it? YOU BET YOU WOULD!

Well, you may not be down and out. But if you are earning A CENT LESS than $100 a week—$5,000 a year—here is your chance to break into real estate MY WAY—build a big-profit business of your own—and make more money than you ever made before. My free book tells the whole story. Get it now!

From Failure to Success

I like to get hold of the down-hearted—the discouraged—the "has-beens" and the "also-rans." It gives me a big "kick"—a real thrill—every time I help a man or woman who felt they were failures. It's easy enough to make successful men more successful. But give me the man who is struggling along—trying to make both ends meet—who has never had a real "look-in" on business success. The most fun I get out of life is turning such men into happy, contented, prosperous, independent business men. And I'm doing it right along! There's E. G. Baum, past 50, lost his job as bookkeeper, sick, discouraged, down-hearted. I got Baum started and he cleaned up $8,000 his first year. And W. A. Rush. He landed in a city in Ohio with his wife and only $50 in his pocket. He started to use my successful Real Estate System and writes me that he now has his own home, a new closed car and "more money than I had when I landed here!" Send for my free book. Learn how I am helping others—and how I can help you—win big business success.

New Lives for Old

I teach ambitious men and women my way of making big money in the Real Estate Business, without previous experience. I give them new lives for old. I transform them from low-salaried employees to successful employers—in business for themselves—independent—prosperous—contented—men and women of all ages—from all walks of life—former mill-hands, clerks, railroad men, barbers, hotel employees, grocers, salesmen, bookkeepers, teachers, ministers, printers, musicians, insurance solicitors, etc., etc. Take "Bill" Dakin for example. He worked for fifty years in New York steel plant. Never had any schooling to speak of. Never had any real estate experience. Bill jumped at my offer. Writes me that last month he earned $1,125 my way. Write for a free copy of my book today. Learn how wide-awake men and women are changing their jobs—trading old lives for new—with my System for Becoming a Real Estate Specialist. Address, President, American Business Builders, Inc., Dept. DD-38, 205 East 42 Street, New York.

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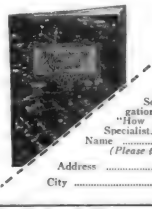

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Letters from the Shop Mail Box

(Continued from page 38)

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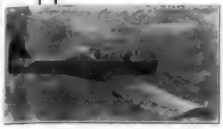

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My 5000 Mile-an-Hour

Fritz Von Opel, German automobile manufacturer and rocket plane experimenter, as he appeared on his arrival in New York recently.

Fritz Von Opel's thoughts on rocket propelled automobiles and airplanes hold more dramatic interest than Jules Verne's yarns because they are based on experience rather than fiction. He tells here why the time is fast coming when the earth can be circum-avigated in six hours.

REGARDLESS of the skepticism of scientists—and I remember how they mocked me before I tried out my first rocket plane last September 30—I am prepared to say that I hope to live until the day when I shall fly a plane, propelled by rockets, around the world in six hours.

Before another year is up I am going to retrace the path first blazed twenty years ago by Louis Bleriot when he piloted an airplane from Calais to Dover across the English Channel. Only I plan to clip off much of the time he required to make the flight. I have calculated that I can make the hop in exactly 14½ minutes.

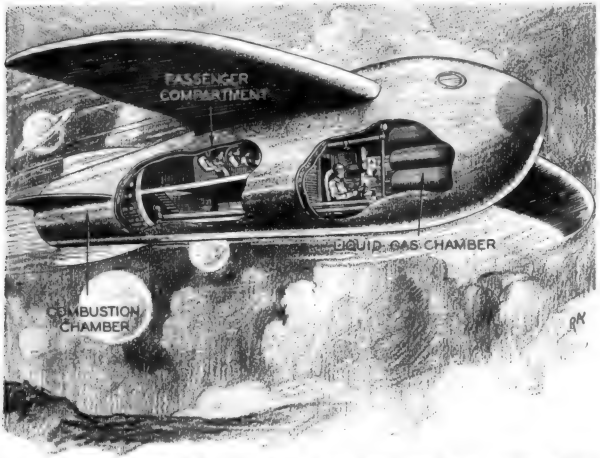
On June 23, 1928, I surprised the motor and mechanical world when I climbed into my rocket car, which they called the "Devil Machine," and reached a speed of 156 1/3 miles an hour on rails near Hanover, Germany. That was 39 miles faster per hour than had ever been previously attained by a car on rails.

This engine was equipped with a case of twenty-four rockets. When I tried to increase its speed further, the car hurtled into the air and tumbled off the roadbed in a flaming mass.

It might have been that the accident was caused by the premature explosion of one of the brake rockets. I escaped uninjured. The misfortune, however, left me nothing

ROCKET PLANE

By FRITZ VON OPEL



Keeping the plane up is one of the problems facing rocket experimenters now, according to Von Opel. High speed will keep the plane aloft, he says, and it operates best at 50,000 feet. Large wing areas likewise are important to keep the ship aloft in the higher rarefied atmosphere.

daunted, for the experiment convinced me of the speed possibilities of rocket propulsion.

I kept right on experimenting with rockets in my laboratory. At the same time I had to watch over my automobile industries, the Von Opel factories at Russelheim, Germany, of which I am general manager.

By last September 30 I was ready to go up in my perfected rocket plane. My machine was smashed up on landing, for I had flown at a height of 49 feet and I had not achieved a sufficient height to insure a safe glide to earth. But the flight was everywhere proclaimed as successful and from that day onward I have been concentrating on new adventures and achievements with the rocket plane.

Many of my friends have asked me where I ever got the idea of applying rockets to motor cars and airplanes. For the first time I will explain it here. When I got interested in aviation and the automobile industry, I remembered that when I was in college I read a treatise by a professor who was at the University of Padua in the Middle Ages.

This professor, whose name now escapes me, went so far as to sketch diagrams, illustrating the application of rockets to airplanes and to submarines. He was a great prophet. He saw ages ahead of his time. The idea of driving a submarine by rockets is not practical, nor is it possible, I have concluded long ago.

I can remember when I was a student at the University of Darmstadt, specializing in engineering, I thought a lot of the Italian professor's ideas, and I hoped to experiment with his theories some day.

College Treatise in Youth Inspired Von Opel's Rocket Plane Idea

Here is shown the remodeled rocket car with Von Opel at the wheel racing through a series of test runs at the Avus track in Berlin. This car is vastly different from the original model developed at Russelheim. It has a larger body, much like a shell, and is fitted with wings projecting from either side to steady it on the curves. A speed of more than 200 miles an hour was obtained.

Theoretically, there is nothing astonishing—I can announce as the result of experiments—about making a speed of 4,000 miles an hour with a rocket plane.

In my last rocket plane flight I used powder rockets. I have given them up and I am going to use liquid rockets in the future. There is no doubt that these chemicals, which are mostly gases, will be better adapted for the successful flying by rockets. The plane which is under construction for the English Channel flight is going to be driven by the liquid rockets.

It is this same liquid rocket which I firmly believe will some day drive men around the world in six hours. This is in striking contrast, to be sure, to the once fantastic plan of Jules Verne to circumnavigate the globe in eighty days. However, the practical uses for the powder rocket still hold when it comes to hurling lines to piers, ship-wrecked craft and in shooting hose for combating skyscraper fires.

The liquid rocket can be operated continuously for about fifty or sixty hours, should the occasion arise, and it has far more power than the powder type.

When this specimen of rocket in which I have chosen to specialize loses weight, the law of balance causes it to move forward — in see-saw fashion — to make up for this deficiency of bulk. The loss of weight is caused by the gradual escape of gas. The rocket's speed depends on the weight of the rocket and the amount of gas lost.

I use two liquids in the head of this rocket. As long as is possible, I am going to keep the names of those chemicals secret. The names of these are considered very precious. These two liquids are forced into a combustion chamber in the head of the rocket by pumps.

In turn the gas formed by the burning of the two liquids penetrates into a larger chamber and then through a smaller aper-

A battery of 24 rockets was used to propel Von Opel's second automobile. How they were arranged can easily be seen from the illustration. Von Opel's first attempt at rocket cars, as may be remembered, ended with the car in a mass of flames after attaining a speed of 156 miles an hour on rails.

Chemical Rockets Best Adapted for Distance Flights Says Von Opel

The first flight of an airplane powered by rockets is credited to Von Opel and was made at Frankfort, Germany. In the air for a thrilling minute and a quarter Von Opel covered a distance of 1¼ miles at an altitude of 49 feet. The machine was wrecked on landing. The inset shows Von Opel at the controls.

ture at the rate of 2,200 metres a second. The flow of the liquid into the combustion chamber can be regulated. So also can the rocket plane's speed.

There is one problem confronting us at present, and that is keeping the plane up. The rocket plane will operate best at a height of about 50,000 feet. High speed will help keep the plane aloft and I think the construction of larger wings will also aid.

No doubt many airplane mechanics and scientists will look upon what I say as being the ideas of a dreamer and a visionary. I am conscious that my projects have been held up to the light of doubt, but I proved I could make a rocket automobile and I did it with the airplane. I am not afraid to predict that I will some day fly around the world at a speed four times greater than that planet revolves about its axis.

Already in my laboratory tests I have reached a speed with rockets of 3,600 miles an hour. Judging from the advances I have made—of course all of that has been in theory—I wouldn't be surprised if I reached a velocity of 5,000 miles per hour with my rockets in my laboratory experiments. I believe the rocket is going to bring aviation into great forward strides. At least, that is my ambition.

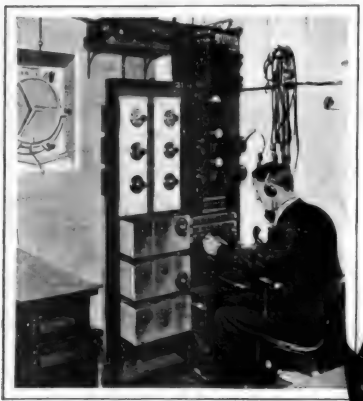
WIN YOUR WINGS!

Every month Modern Mechanics helps some lucky person to realize his ambition to become a pilot.

Read page 80 and find out how you can

WIN YOUR WINGS!

Ship to Shore Phones for Travelers



To the left is shown the interior of the deck house of the S. S. Leviathan which houses the short wave radio telephone equipment necessary for ship-to-shore conversation. The receiving set with internal telephone extension plugs is on the right.

Instead of the ordinary phone instrument a microphone transmitter is provided to afford the highest transmission quality for the radio link between boats and those ashore. The greater sensitiveness of the mike insures better broadcasting of voices that even the average phone has difficulty in picking up.

Some idea of how the world is encircled by a network of phones can easily be gathered from a glance at this switchboard in the foreign service section of the Bell Telephone System in New York. Voices going to or from radio phone stations at Deal and Forked River, N. J., pass through this board for routing to their destination. The board varies but little from the "local" type.

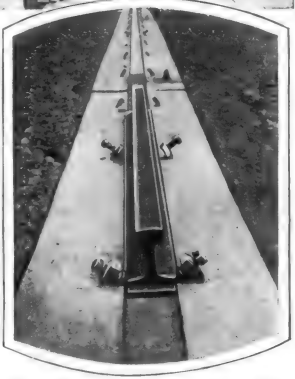
Railways Meet Speed Demands With Concrete Roadbeds

IF IT isn't fast, it isn't modern. Motor highways have been revolutionized to meet the demand for faster traffic. Airways have been developed to provide fast service. But the railways have been until the last year or so, slow in developing their speed. Trains now run faster and there are air-rail services.

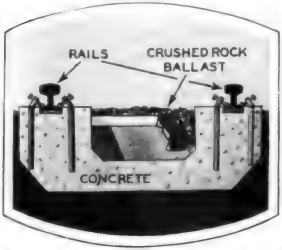
But speed for the railways presents many problems. The trouble is in the roadbed. For nearly 90 years roadbeds have essentially been unchanged. Three years ago the Pere Marquette railway built a quarter mile of reinforced concrete slab roadbed on the main line at Beech, Mich. It hasn't cost a penny for maintenance. It is too short a strip for positive tests but is known to permit greater speed for heavy trains. The first cost was expensive and the rails resting on concrete resulted in noise.

A new design was then determined upon. Instead of laying the concrete on the job, 19-foot uniform sections are cast at the shops and cured. Each unit is made to fit neatly by a tongue-and-groove arrangement with its neighbor. Labor of making and laying the slabs is less than for an ordinary track laying job. Perfect alignment of rails is secured and under the rail a thin slab of rubber and timber deadens sound.

Laying the concrete roadbed in forms. Now the bed is cast in sections and laid that way.



View of rails showing angle bars and bolts which clamp the rail into position over thin layer of wood and rubber.

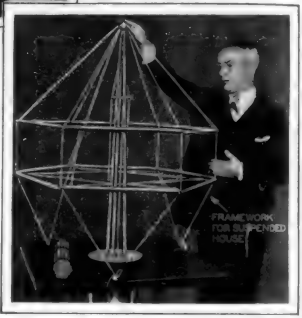


A cross-section sketch showing the sturdy roadbed which makes for much faster travel by rail.

Novel Ready-Made Hanging House Has Inflated Walls

Sketch of suspended house with supporting pillar. Its walls are inflated and retain even temperatures. Can be cleaned in 15 minutes.

R. BUCKMINSTER FULLER, architect and inventor, has modeled a suspended dymaxion house, which he claims to be the model house of the future. The five room structure, which can be made to sell for $3,000 embodies the most modern principles. These include inflated floors and walls which would keep the house at an even temperature. Housework would be reduced to a theoretical 15 minutes a day. The house would be dust proof.



Inventor with basic framework of model house. It is rightly called "paradise for housewives."

Carp Destroy Other Fish

CARP get the better of other fish whose waters they invade, literally by eating them out of house and home. This has been disclosed by the drainage of a small lake in Wisconsin which was studied by Dr. Alvin R. Cahn of the University of Illinois. Out of a total of 6,006 fish in the drained lake, 5,891 were carp.

Baby All-metal Racer Is Built

LUCKY kiddies hold races with their beautiful model of an all-metal racing car. The two girls below have interested a mechanic in overhauling their machine. It is "foot-powered" and follows the lines of the most expensive automobiles. The tires are solid rubber.

Youthful mechanic aids a beauty in distress.

Excitement Causes High Pressure

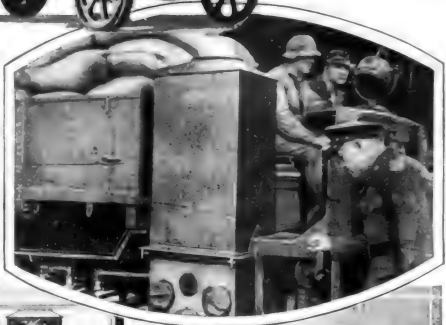
HIGH blood pressure, called the "business man's disease" and believed to be increasing rapidly in civilized countries, is ascribed by a Berlin medical authority, Professor J. H. Schultz, not to such conventional causes as diet or germ disease but to too much excitement. The habit of getting excited may be an abnormal characteristic of one's brain, Professor Schultz believes, or it may be due to exciting circumstances of a person's daily life, repeated often enough to become habitual. This latter cause probably explains the prevalence of high blood pressure among stock brokers.

Army Tests Imbert Wood-burning Truck

A SCIENTIST once declared that if it were possible to release the energy of a single atom it would drive a train from Chicago to New York. He was theorizing. Today a five-ton truck may be driven at 30 m.p.h. for five hours from the energy released by burning ordinary wood. This is *not* theory. It is a fact, made possible by Col. Jean P. Imbert, of Sarre-Union, France, late of the French army and now being tested by the U. S. army.

The gazogene truck has a capacity for 80 gallons of gas or 150 lbs. of wood. This will last from 4 to 5 hours. Tests show that 3½ lbs. will run the truck one mile. One gallon of gas on the same road with the same truck gave 4 miles.

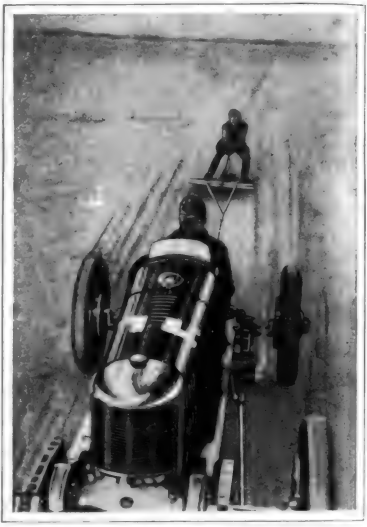
Assume that a cord of wood costs $4.00. It would run a Liberty truck—capable of 4 miles to a gallon of gas—about 325 miles.



The Imbert Gazogene utilizes ordinary wood, green, wet, rotten or dry, in the place of gasoline. The gazogene is formed from the smoke and fumes of small blocks of wood placed in the tank at the right of the truck and ignited with burning oil waste. The blower is operated manually for three minutes, which causes the wood to burn and the smoke to go into the canisters where it is "cracked" and the gazogene made ready for the motor. The truck shown operates also with gas.

Motor-Planing Is Newest Thrill

Sailing across the sands at the rate of 75 miles an hour is the new sport engaging the attention of California thrill seekers. Doug Harper, who tried the stunt, tells us a few things about it.



Doug Harper got the thrill of his life when Lewis Moore, Indianapolis race driver, dragged him across the dry lake bed at Muroc, California, at seventy-five miles per hour.

THRILLER seekers, lend us your ears. Here is a new one for you to try that has all the excitement of aqua-planing, ski-jumping and other devil-may-care feats beaten to a stand-still. And it's perfectly easy when you know how to do it. Balance 'n nerve, that's all that's needed in addition to a speedster that can drag a board behind it at 75 or 80 miles an hour. Simple, what?

To Doug Harper goes the crown of pioneering this new thriller. He hitched his plank to the back of Lewis Moore's car in California not long ago and succeeded in keeping himself upright as the Indianapolis race driver speeded across the dry lake bed at Muroc, California, at the rate of 75 m.p.h.

Harper's interest in "motor-planing" is keen. To him it is a greater novelty than aqua-planing. After he got through his first attempts he did not hesitate to proclaim the thrills he experienced. Speed and then more speed is his first wish. That is why he can't get a kick out of sailing along behind a powerboat. They can only go a limited speed at best whereas an automobile can cover ground much faster than a boat, he says.

In telling about his race over the sands, Harper left behind a few suggestions that it is not amiss to tell here. One of the first recommendations that he made was that the "man behind" equip himself with the strongest pair of goggles that he can find. The blowing sands and pebbles that are thrown up by the wheels of the car as well as by the speeding board have the power of a bullet and unless proper precaution is taken serious harm can come out of this sport.

Equally as important, to Harper's point of view, is the proper protection of the body against spills. For his stunt Harper provided himself with the shoulder and shin guards used by football players. Thus, with his legs and shoulders shielded, he was ready for any sudden tumbles.

As far as the "motor-planing" equipment is concerned, Harper suggests a steel cable between the board and the car. Due to the greater strain even a stout rope cannot stand the wear and tear of continuous swaying and chafing that an uneven ground surface will cause.

First Airplane Launched From a Speeding Automobile

AT OLD Orchard Beach, the Maine "jumping off" place for trans-Atlantic flying enthusiasts, the first airplane ever launched from a speeding automobile was recently shot into the air successfully. The car, carrying the plane on a special carriage, traveled 52 m.p.h. before the ship, which weighed more than 1,300 pounds, left it and flew under its own power.

The construction of the launching platform is simplicity itself. Ordinary wooden planking mounted on a steel pipe frame, braced for support to the forward end of the chassis and just above the gas tank in the rear, was of sufficient strength to hold the ship as the car sped over the sands of the beach.

The first airplane successfully launched from an auto top.

The responsibility for successful launching rests virtually on the driver of the car to retard his speed as the plane leaves the top. With both the car and plane motors giving their maximum capacity the sudden lifting of the load, either momentarily or permanently, might jerk the ship enough to throw it off balance.

How Electricity Operates Clocks

ELECTRIC clocks are entirely different from the old style, spring-driven clock with mechanical escapement. Electricity supplies the power to run the clock and the means by which it is regulated and kept in step with Observatory time.

Most power companies have arranged to regulate the frequency of the alternating current so that electric clocks, when used on their lines, will tell correct time. They accomplish this by means of a master clock at the generating plant.

The mechanism is not delicate and is not comparable to the usual clock mechanism in any way.

Discarded Wing Makes Ideal Sail

A UNIQUE experimental rig, comprising a discarded airplane wing and short length mast, fitted to a Star class boat was recently tested by Butler Whiting off the coast of Florida. Among the features of sailing wing-equipped ships is their maneuverability, according to Mr. Whiting.

Easy handling, a feature of unique rigged boat.

Speedway RACERS for

Insert—Fred S. Duesenberg, vice-president in charge of engineering, Duesenberg, Inc., Indianapolis, Ind. Photo of the race car shows Peter De Paolo, 1925 AAA champion, behind the wheel of a Duesenberg racer which won the Indianapolis classic.

A MAN asked me the other day whether speedway racing had ever benefited the average pleasure car owner. For answer I took him over one of our Deusenberg cars, piece by piece, and pointed out where race car design had been copied in the 265 horsepower pleasure car. When we got through we estimated that fully ninety percent of the car owed its origin to tests and experiments on the speedway. In fact, a large part of the present car is an exact duplicate, on a larger scale, of parts used in the last racers I built, the little ninety-one cubic inch, one man speedsters which have now been banned from the Indianapolis 500-mile contest.

Compared to those little ninety-one jobs the 420 cubic inch pleasure car is a giant, not only in its power plant but in every part of the chassis. Yet all we have done to many parts is increase the size, without changing the shape.

Speedway racing has made possible every fast car on the market today. There isn't a successful automobile with a top speed of more than seventy miles an hour that would be safe to drive, if the designers had not had speedway experience to fall back on.

And yet the automobile today, as fine as it is, still offers plenty of opportunity for advancement. Within the next few years we are going to see still better engines, a necessity to stand the high speeds that are being developed. They will have better pistons and piston rings—in fact that last problem has just been solved. For the benefit of the driver two important advancements are bound to come—automatic transmission, which will eliminate the gear shift lever and automatically change the gearing as the amount of gas fed to the engine is changed, and free wheeling, which is the next thing to automatic shifting. Free wheeling is only a matter of weeks away

EVERYBODY

by FRED S. DUESENBERG
Famous Automobile Designer

Cars with "coaster brakes," automatic gear shifting, and power steering are predicted as the next steps forward in automobile design by Fred S. Duesenberg, who shares with Harry Miller the honor of being America's foremost builder of racing cars. In this timely article he tells how the twenty-three million car owners of America have profited by the gruelling tests of automobile design carried out on speedways.

The Duesenberg 265 h.p. pleasure car, largely a duplicate on a larger scale of the famous little one-man racers of Duesenberg design.

Fred Duesenberg at the wheel of a Marion car which he rebuilt for racing. Note the separate cylinder intakes. In 1903, with this car, he beat Jed Newkirk, driving the famous Ford 999, the first driver of which was Henry Ford himself.

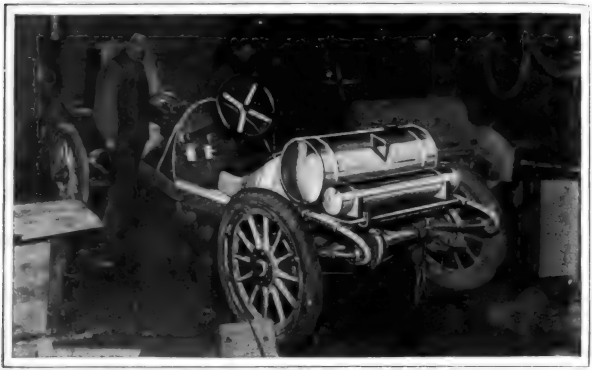
right now. In fact my brother August is at this moment building a number of experimental transmissions to bring this about.

By free wheeling I mean a transmission which permits the engine to pull the car, but prevents the car pulling the engine. Compared to the present automobile a car equipped with a free wheeling device is like a bicycle equipped with a coaster brake, as compared to one without it. Remember the old style bicycle, that you had to pedal even when going down hill, and what a relief it was to get a coaster and sit at ease while your momentum carried you along? That was free wheeling.

Equip an automobile with the same feature and we have found, in tests over the Indiana roads, that we can save thirty-one percent of the gasoline normally consumed. The engine pulls the car up the hill, but as you start down the engine idles and the car whisks along under its own momentum as it responds to the pull of gravity.

When that happens you can shift gears without depressing the clutch, in fact the clutch is never used except when starting. Therefore there is no more wear on the clutch than there is on the bendix drive of the starter. All of the wear and tear on

Duesenberg's Earliest Racers Took Form in This Back Yard Workshop



Fred Duesenberg, at the left, in the shop at Des Moines where he built the three cars raced in 1911 and 1912 under the name of Mason Specials, one of which is seen in the foreground.

the transmission and the damage done to the engine by its own braking effect when going down grade is eliminated. Ninety-nine percent of the damage done to a rear axle occurs while coasting.

How is this accomplished? A device adding less than three inches to the rear of the transmission box is all that is added. In it are two cups, fitting inside each other, with a coiled, machined spring in between. When they revolve in the direction in which the spring is wound they turn easily on each other, hence the rear wheels may be turning the propeller shaft, on a down grade, much faster than the engine is driving the transmission shaft. But try to turn the engine shaft faster than the propeller shaft is moving and the coil spring expands slightly, grips the outer cup, the two lock and power is transmitted direct to the wheels.

In a simple demonstration outfit, such as is pictured in one of the illustrations, you can drop a pencil lead into the hole in the outer cup, and all the force two men can exert on the lever handles isn't sufficient to break the lead against the end of the spring. Why? Because the force is instantly transmitted as a bursting stress against the outer shell or cup. With a twelve turn spiral spring it has been estimated it would take a 12,000 pound force to move it enough to break the pencil lead. Add a thirteenth turn and the force jumps to around 40,000 pounds, with similar increases for each turn added.

To reverse a car so equipped a locking lever is added to lock the free wheeling device. In all forward speeds, regardless of the rate at which the car is going, the gear shift lever can be shifted up or down from any speed to any other, without depressing the clutch, by simply idling the engine. If you are going sixty miles an hour in high speed you can lift your foot off the accelerator and shift down to intermediate or low. The shift lever moves so easily it feels like it had broken off at the lower end.

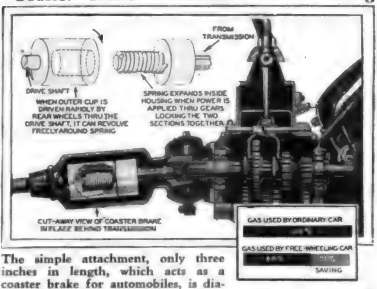
There are several automatic transmissions, which eliminate the gear lever entirely, and automatically select the proper gear ratio as the fuel feed is changed, but none of them quite satisfy car designers, as yet. Sooner or later it is bound to come.

Even power steering, for parking purposes, may be available before long. You know ocean liners are not steered by the steering wheel. All it does is operate a steam steering gear, which employs power

to move the huge rudder, which often weighs twenty tons or more. A touch of one finger on the wheel on the bridge is sufficient to handle a thirty or forty thousand ton liner.

Three or four years ago I built an experimental power steering device for automobiles. So far it hasn't been worth the added cost and the added mechanical complications. It would not be used at all on the road, for any good car can be steered with one finger when under way. With the increase of parking difficulties in cities, however, it may come before long to enable the wheels to be turned with ease while the car is standing still. Or, instead of power, the steering wheel may be fitted with a two speed arrangement and a gear shift lever so the driver can get sufficient gear ratio to turn the front wheels easily. If power steering is adopted some day it probably will be fitted with an automatic lock so that it can only be used in low and reverse, as its response would be too slow to make it safe on narrow highways at high speed.

"Coaster Brake" Promises Free-Wheeling



The simple attachment, only three inches in length, which acts as a coaster brake for automobiles, is diagrammed above. When going down a hill the rear wheels propel the drive shaft faster than the engine, disengaging the coaster brake connection as shown and permitting the motor to idle. In straight driving the coil spring at the end of the transmission shaft expands and locks the two sections of the coaster brake together. Gasoline consumption is reduced 31%.

Back in the nineties bicycle racing was the great sport of speed fans, and in this game Fred Duesenberg got his start on the race tracks. He is shown at the left in this old-time photograph.

The most asked question in the last year has been why we built a 265 horsepower car that would do ninety in second and 120 or better in top gear. Anyone who has ridden at average road speeds in a car with a maximum far beyond the average knows the answer. The strain of driving has nothing to do with how fast the scenery is flashing by. The strain is due to vibration and engine noise—the fuss the motor and chassis make when near their top speed—and the tendency of a car to weave about the road as it nears its highest speed.

If weaving, noise and vibration are excessive at 50 to 60 or 60 to 70 miles an hour the drive is far more fatiguing than one at ninety or a hundred miles an hour in a car which has a top speed twenty or thirty miles higher. Experience has shown 23,000,000 American drivers that the closer a car is driven to top speed the less attractive becomes its performance. If a 70 mile an hour car is driven at 65 the whole mechanism is working so hard, that, like a runner out of breath, it makes audible protest against the strain.

With a car that is capable of better than 100 miles an hour forty to sixty is just loaf-

(Continued on page 192)

LEARNING to FLY

Kelly Field, San Antonio, Texas, army training school for many famous flyers.

How to get into aviation—that is the question being asked these days by seemingly ninety per cent of the country's young manhood. One of the best flying schools in the world is run by Uncle Sam, and he pays his pilots a salary while learning. This article will help you to decide if you are qualified to become a flyer at government expense.

EVERY morning when the mail is opened in the air corps offices of the big army headquarters down on B Street in Washington a number of letters are laid aside, to be answered by America's most popular aviation book—a little twelve-page pamphlet entitled "Flying Cadets of the Air Corps" or "Aviation as a Career." Under the seal of the War Office the Adjutant General of the army tells in those twelve pages how to go to the school that produced Lindbergh, and become one of the world's best flyers at the expense of Uncle Sam.

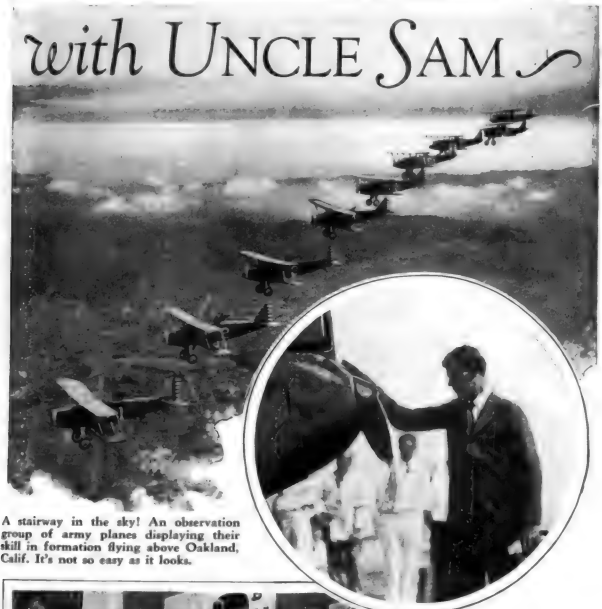
Three times a year, on March 1, July 1 and November 1, from two hundred to two hundred and fifty young men—unmarried, between the ages of twenty and twenty-seven, with two years of college education or its equivalent—matriculate at Brooks and March Fields, the first in Texas and the second in California, for six months of primary training. Those that survive the weeding out process get a chance at a harder, stiffer six months at Kelly Field, to graduate, if successful, as second lieutenants of the Air Corps Reserve. All, or most of them, then are offered their choice of either returning to civil life to take up flying in a commercial way, or a second lieutenant's commission for one year in active service.

How to get a free flying education in what are conceded to be among the world's finest flying schools, and even draw a salary while being educated, is a question that intrigues more young men, perhaps, than any given subject connected with aviation.

Here's the answer:

The adjutant general has specified eleven different ways of getting a chance to take the preliminary examinations, and appointments are made from them in the order of listing. First come enlisted men of the Air

with UNCLE SAM



A stairway in the sky! An observation group of army planes displaying their skill in formation flying above Oakland, Calif. It's not so easy as it looks.

The medical office is an important adjunct to Kelly Field. After the pilot-to-be has passed his physical exam—and only the most fit are admitted into the squadrons of this select school—he is kept in tip-top physical trim. A typical scene is shown above.

Kelly Field's most famous student, Col. Charles A. Lindbergh, is shown in the circle twisting over the prop of his plane motor. Col. Lindbergh stands as an excellent example of the thoroughness of the course of training undergone by army pilots. Entirely aside from flying lessons, students at Kelly Field are taught aerial photography and interpretation, radio and signal communication, bombs and explosives, observation tactics, attack and bombardment problems, and scores of related subjects. A total of 284 hours of actual flying time is required of students during their year of training, in addition to 152 hours in the ground school courses.

Lecture Courses Prepare Student Pilots for Actual Flying Instruction

Air photographs projected on a screen give pilots-to-be a good idea of what the ground looks like from a height of a mile or more, and teaches them to distinguish suitable landing fields.

Vision of army trained pilots must be practically perfect. Above, an officer is shown having his eyes tested for the angle of convergence. Corrective lenses are frowned upon for an airplane pilot, for although it is quite possible to wear such lenses in goggles with good results under ordinary circumstances, fog and smears of oil have been known to cover the lenses in times of emergency, rendering the goggles useless. There must be no color blindness and the visual field must be normal.

Pilots whose lives will hang on fragile wings of wood and fabric must know thoroughly just how those wings are constructed and just what may be expected from them in flight. Students are shown applying fabric.

Insides of Airplane Engines Hold No Mysteries for Kelly Field Cadets

Knowing what to do when something goes wrong with the motor is an important part of a pilot's training. The above photo shows the type of outdoor shop equipment used by army mechanics.

Corps of the regular army who have had at least six months service. They get first chance, above all others, if they can qualify.

Next come enlisted men of other branches of the army who have served at least six months; then officers and enlisted men of the national guard, who have been assigned to guard air units for at least a half year; college graduates who have graduated from Air Corps reserve training units; college graduates who have graduated from train-

When the propeller quits whirling a pilot has to find some place to land in a hurry. That's the "why for" of the propeller study division at Kelly Field. A corner of the workshop is shown.

Skill in Packing Parachutes Is Tested by Actual Jumps From Airplanes

Proper packing of parachutes is an operation on which a human life may depend. These embryo pilots are learning the intricacies of 'chute-packing, and when their lessons are well learned they will put them to the test by making a jump as shown at the right.

ing schools of other branches of the service; other officers and men of the National Guard; graduates of recognized colleges and universities; students who have completed their junior year in Air Corps reserve training units; other officers and members of reserve corps units who have had at least six months training; college students in good standing who have completed their sophomore year; and finally, "others," which means anybody not otherwise listed.

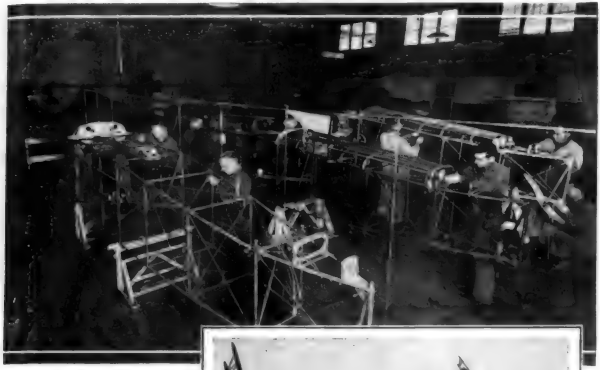
Applicants who can supply the required references and affidavits attesting to character, reputation and scholastic standing are examined three times a year, usually the second Tuesday in April, August and December. A physical examination comes first, with special attention to vision, hearing and balance. Then an education test in history, grammar, composition, geography, arithmetic, higher algebra, plane and solid geometry, plane and spherical trigonometry, and elementary physics.

If the candidate gets that far at his own expense, the government sends him to one of the primary schools, either Brooks or March, for the third, and most important part of the test, the psychological examination.

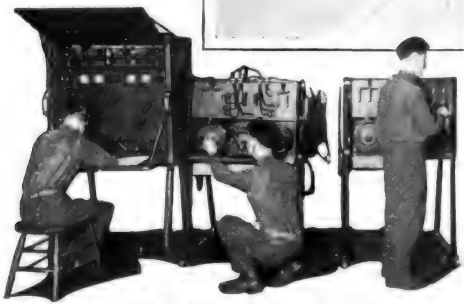
An excellent demonstration of "slipping" a parachute to steer it is being given by the jumper in the above photo. By pulling on the shroud lines he has succeeded in deflating one edge of the parachute, which responds by drifting in that direction. In this way ground obstacles can be avoided, and safer landings assured.

A year at Brooks, March and Kelly is 365 days of the hardest kind of work. Just to start with in the primary schools there's sixty hours of infantry drill to turn raw recruits into soldiers; eleven hours of army

Student Pilots at Kelly Field Complete 150-Hour Ground School Course



Fuselages of various types of airplanes are built up complete in Kelly Field shops. Above a group of young pilots is shown at work on three fuselages. When they finish this phase of their instruction they are thoroughly familiar with the internal construction of the man-made birds which the student pilots are learning to put through their sky paces.



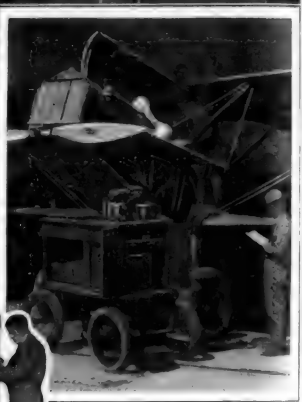
In the electrical shops at Kelly Field. Wartime hangars depend on telephone lines to supplement their communication with the front lines, and men must be trained to keep the electrical apparatus in perfect working order at all times.

Above—
Rounding a turn in a break - neck air race. Kelly Field graduates are masters of aerial acrobatics, for it is in the military pursuit that the ability to maneuver a plane into all sorts of unexpected positions is essential. "No stunting" is a rule strictly enforced on commercial airlines where passengers might be endangered, but army pilots must be "stunters" of the nth degree.

Aerial bombs play an important part in the life of a military pilot, and Uncle Sam gives his fledglings a thorough course of instruction in the making and handling of these death dealing weapons. Note the various sized bombs shown in the photo, intended for use in different types of airplanes.

paper work to master the red tape; eight hours of army regulations; ten on guard duty; twenty on military law; eight on property accounting, and miscellaneous hours on such things as military courtesy, customs of the service and hygiene and first aid.

Primary flying training itself includes 215 hours in the air, of which not less than fifty is dual and solo instruction on simple maneuvers. Then there is thirty-two hours of cross country, thirty-two of formation flying and five of night flying, or a total of 284 air hours.



Checking up radio equipment in a fighting plane. Uncle Sam's graduate pilots are all experts in the use of radio, often receiving instructions from ground stations after they have taken to the air.

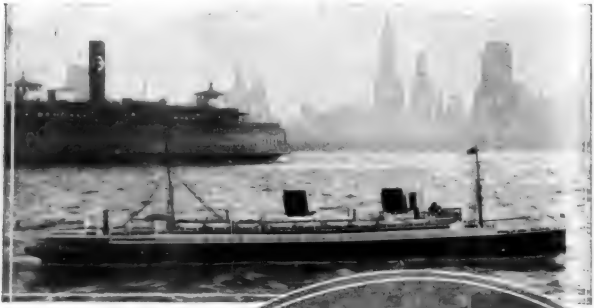
Just as important as receiving equipment in an airplane is the ground station from which military officials keep in touch with the pilots.

Fifty hours flying as observers completes the air course at Kelly, but all the time the air work has been going on there has been 152 hours of ground classes covering observation tactics, radio, bombs, and so forth.

Hours of instruction in the ground schools are mixed in with hours of instruction in mimic warfare in the air.

Signing the flight report as a full-fledged pilot after a year's intensive training at Kelly Field. With a total of more than 350 hours in the air, in addition to the intensive ground school courses, the fledgling who was a green student only a year before blossoms out as a graduate army pilot.

Thirty-Nine-Foot Ship Model Proves Her Seaworthiness



IF THE owner of this trim little craft had buried his head a bit further one would quite readily agree that the pictures shown here are those of the new liner *Columbus* steaming its way through New York Harbor. But, as long as he didn't we'll admit that it is—but in miniature.

This 39-foot model of the *Columbus* proved her seaworthiness recently by going out to meet her famous namesake. It carries three "passengers" as crew and makes eight knots an hour with its two five-h.p. motors. It is perfect in every detail.

This sea-going model of the giant steamship Columbus actually goes out to meet its big sister. It is powered by two 5 horsepower motors and is capable of eight knots an hour.

Arctic Sun Photographed at 15-Minute Intervals on Year's Shortest Day

This camera study of the Northern sun was made by Maj. H. L. Twaddle on Dec. 21, the year's shortest day. The total time between "dawn" and "dusk" was 2½ hrs. Yukon river is in foreground.

Engineers Progress in "Talkie" Development

The three stages of film "editing" require great care. The sound film must fit exactly the action in the silent version. The "focussing" mike, too, is of recent origin. This is directed to the sound source the same as the camera.

The development of the camera, from the portable machine at the left to the latest traveling model, carrying its own soundproof booth, has likewise been rapid. Remote controls, sound and picture recordings in one unit and selection of sound are ideas recently incorporated.

The movieola has been especially devised to let the editor see and hear the picture at the same time. Both films—sound and image—pass through the machine at one time. Wherever editing is necessary the instrument can be stopped, the film cut and pasted, and then continued. Jane Loring, noted film editor shown above, has said that this instrument has increased the speed of editing about five times.

WHERE IS RADIO

What about television? Sets? Broadcasting? Radio development? Those all important questions on the future of radio are answered here by Powel Crosley, Jr., who, as a pioneer in the development of broadcasting and transmission, as well as radio set construction and design, occupies an outstanding place within the industry.

WHERE is radio headed, and what are you going to do next, has been the stock question to open any interview with any radio manufacturer since the first day of broadcasting.

And this year, for the first time, the radio manufacturer can sit back in his chair, smile blandly at the interviewer, and announce radio isn't going any place—it has arrived!

And that means more than just the fact that the radio maker doesn't have to face the possibility of junking his entire production program, and all his dies and jigs and some machinery next week or next month to rush into production with an entirely new and more modern set.

It means—and this is the really important thing—that for the first time the radio fan can buy a receiver as a permanent investment, something he will expect to get years of service out of, just as he gets years of service out of a piano, or any other piece of living room equipment. He doesn't have to figure on trading the set in next year on a new and better model.

Radio is over its growing pains, and has settled down for its real years of usefulness. Development, in the immediate future, will be along the lines of simplicity and greater attractiveness. It took the automobile nearly twenty years to get over its growing pains and settle down to a program of logical improvement. Radio has gone as far in less than ten years. Remember the early automobiles, when manufacturers weren't sure

There is no spot more interesting to Mr. Crosley than his "lab" with some new idea to test.

GOING?

POWEL CROSLEY, JR.
asks and answers this vital question

"This is Station WLW, the Crosley Radio Station located in Cincinnati." From here daily programs reach every corner of the world.

whether they should have two cylinders opposed or two to four upright; whether the crank belonged in front or on the side; whether the tonneau door belonged in the middle of the rear seat or on the side, or even whether there should be a door? Radio started out with the same kind of problems. Quite young boys and girls can remember arguments over the relative value of crystal sets versus one, two or three tubers; of headphones versus "morning glory" loud speaker horns; of one, two or three tuning controls, and, a little later, super-hets versus neutredynes and various tuned circuits; magnetic horns versus magnetic cone speakers, and transformer and resistance coupled audio or intermediate stages.

Those were the happy days for the home set builder. New things were appearing so fast that to keep pace with the development of radio art a receiver had to be rebuilt about once a month. In the very nature of things the amateur who built his own receiver could try out a new stunt about a year before a manufacturer could test it, tool up and get into production.

A leader in radio—Powel Crosley, Jr., radio engineer and manufacturer, recorded in crayon and wash by famous Howard Chandler Christy.

But at this year's radio shows parts and kits for home built sets, with the exception of short wave outfits, had simply disappeared from the market. At least there seemed to be none on exhibition.

No one can say that the screen grid tube is the last word in radio development, but

Above Mr. Crosley is seen with George Gershwin, Alma Gluck and Efrem Zimbalist who helped test the tonal qualities of Crosley sets. Unusually keen auditory powers are needed to determine the proper tone. The lower "shots" show further tests in the Crosley laboratory at Cincinnati.

it is significant that, with the new tube, all of the past achievements of radio can be brought together in one set, a receiver which is all things and does all things that various sets of the past have done, and does them better.

If you will recall the history of radio development you will remember that each year since 1921 has seen a new and epochal development. The transition from the crystal to the early tube sets was the first great advance. Every radio enthusiast was singing the same theme song—give us greater sensitivity so we can get "DX". A set's worth was judged by the number of distant stations it brought in.

On the heels of the craze for sensitivity came the demand for greater selectivity. A receiver's popularity that year depended on the sharpness with which it could be tuned. Manufacturers developed the three circuit tuner and radio-frequency amplification. Sensitivity was lost, but the fans disregarded it, if the receiver had razor edge sharpness. The remarkable spread of broadcasting was in a measure responsible for the change, fans in the bigger cities demanding sharp tuning in order to cut through the crowded air, and, as broadcasting had improved and chain programs were coming into use, distance had ceased to hold its charm as compared to good but more local reception.

The single dial receiver marked the next milestone. It was hailed as a tremendous improvement over the set with three cumbersome tuning controls. Tone quality also was becoming a talking point; the magnetic cone was replacing the horn, and power tubes and better audio transformers had begun to appear.

The year 1927 was the year of the big revolution, when the radio world suddenly went "AC". Manufacturers selling battery sets one day could hardly give them away the next, so sudden was the transition. With the all-electric set the biggest objection to radio, troublesome batteries and eliminators, disappeared.

And in 1928 the electro-magnetic speaker swept the boards and, so far as manufactured sets of quality went, practically eliminated every other type of reproducer.

Finally came 1929, the year of the screen grid tube and the assembling of all that had gone before into one set, a receiver that has more sensitivity than any "DX" job of a few years ago ever dreamed of, that has

selectivity, one dial control, economy of operation, tone quality, and perfect reproduction.

Along with those advantages, radio builders agreed that radio must appeal to the eye as well as the ear, because women in the home insist on beauty that matches its surroundings as much as they do on tone, volume or distance.

There again the development of radio has paralleled the development of the automobile, for once the major mechanical "bugs" had been eliminated, the electric starter and electric lights added, and fore doors put on to enclose the body, the auto industry settled down to simplify, improve and beautify, without any revolutionary major changes in the machinery.

I look for steady development the next few years toward improvement of parts and manufacturing methods, and toward the design of even more beautiful receivers. Aside from new designs in cabinets, the greater part of this work may be done so quietly the public will never know of it. The screen grid tube, so far as we can see now, has come to stay, for it has eliminated many of the makeshifts made necessary in the development of sets using the three element tube.

The fact that the screen grid tube has an amplification capacity of about forty, as compared to from five to twelve in the old tubes, tells only a part of the story, and that, in a way, the wrong part, for no one wants or could use the total amplification per stage of which the new tube is capable.

Of real importance, however, is the virtual elimination of that feed back capacity between the grid and plate which was one of the out-standing defects of the old tubes. All the work that was done to develop methods of balancing, all the neutralizing methods, all the complicated transformers and condensers and wiring, all the careful balancing and rebalancing of the sets, was swept away over-night by the screen grid tube.

While the great amplification they make possible is not a major advantage, it is true that the screen grid makes such a great gain in the radio frequency portion of the set that we are able to cut down on audio amplification, and therefore can use resistance coupled audio, with consequent improvement in tone quality. It permits the use of the bias

(Continued on page 206)

Although Mr. Crosley has not committed himself on the manufacturing of aircraft, the company owns a number of ships for use in the transaction of business. The picture of the announcer reveals Mr. Crosley broadcasting a ball game from Red Park, Cincinnati, before the advent of booths.

Whaling—the Sea's

ALTHOUGH many substitutes have been found for whale oil, bone and their byproducts, there are hearty seafarers still who thrill to the cry "Thar she blows!"

Today, hunting "big game" of the seas differs little from years ago. The same dangers are encountered. The same chase and wild ride across mountainous waves behind a harpooned whale. And only slightly have modern methods touched this picturesque industry as these illustrations show.

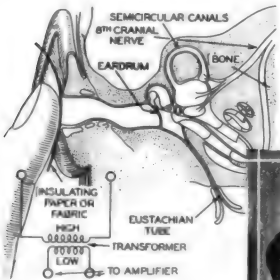
Cutting the first slice of blubber from the whale is an honor reserved for the "hero" of the chase. This is the slice richest in oil-giving fats and is cut from the underside of the monster. The old-time hand harpoon has been replaced by the whaling gun. The harpoon weighs 129 pounds and is equipped with a time fused bomb screwed into the end. Power-driven saws cut the whale's head into sizes suitable for the boiler. A single fair-sized whale often returns $2000 to its captors.

BIG GAME HUNT ~ ~ ~

The last "stop" of the whale before it reaches the flencing, or cutting, platform. Here these sea giants are held until the cutters are ready to go to work on their carcasses. Every portion of the whale is used, even the residue being used as fertilizer.

A fair day's catch leashed to the side of one of the boats used at Deception Island in the Wilkins-Hearst Antarctic Expedition. The whaling gun, together with its coil of rope ready for immediate use, can be seen in the prow of the vessel. The construction of the reels immediately below the gun is interesting. They act as a buffer as well as spool for hauling in the catch. The "look-out's" platform is shown on top of the cabin in the center of the ship. Note the powerful whale flukes.

Fingers "Speak" Words Electrically Stored in Body



SPEECH and music projected into the head was demonstrated by S. P. Grace, of Bell Telephone Laboratories, recently. In carrying out the demonstration Mr. Grace and R. M. Pease, each placed a hand against the head of the person selected. Immediately he clearly heard words or music.

The principle was that of electrostatic attraction, or the fact that electric charges tend to attract or repel anything in their neighborhood. The sounds were reproduced electrically and the resulting potentials, powerfully amplified, were passed to the hands on which accumulated small electric charges. These charges caused the listener's eardrum to vibrate. The effect was quite pronounced even though the ear was shielded with paper.

The use of the ear as a "receiver-condenser" was demonstrated recently by S. P. Grace, left, and R. M. Pease. A message spoken into a phone was stored in a "delayed" circuit and after several seconds was transformed into high voltage and passed into the body of the demonstrator. He in turn placed his finger on a third person who "heard" the message.

Led Byrd to Pole Without Hitch

IT WAS a compass such as this that guided Commander Byrd over the South Pole.

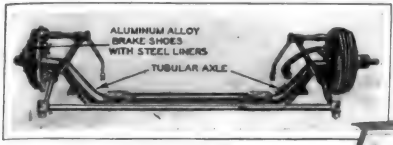
By sun's rays this compass, unaffected by magnetic disturbances, led Byrd to the South Pole.

Radiator Hose Always Needs Care

NO SEASON is entirely free from radiator hose trouble. In the spring trouble is likely to occur because of the deteriorating effect of the winter's anti-freeze solutions. During warm months the continuous high temperature to which the engine is subjected is likely to result in deterioration.

While the outside of the hose may appear to be in good condition, cooling system trouble should always result in a careful inspection of connections. If the hose is long enough to permit of compressing it between the fingers, it will prove whether or not the inside has become curled or broken up. The best plan is to remove the connection and inspect it thoroughly to learn if the lining has curled and loosened and become lodged in the radiator.

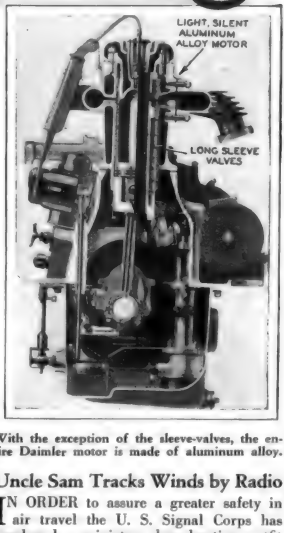
Daimler Aluminum Automobile Power Unit Introduced



The front axle beam, brake shoes, frame brackets and spring anchorages are of aluminum alloy. The body is covered with fabric as this is silent and non-drumming.

The cylinder block, crankcase, oil pan, bell housing and gear box are made from a secret aluminum alloy, as are the pistons and connecting rods, carbureter and induction manifold.

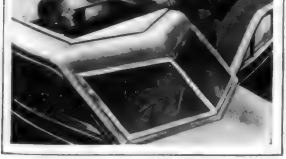
DAIMLER of England has just introduced an automobile into the construction of which aluminum enters to such a great extent that the machine can truly be classed as revolutionary. This concern was the first to utilize the American Knight sleeve-valve patents. Their products have always been noted for refined silent running. In an endeavor to achieve speed and performance they have re-designed their famous 25 h. p. model and built most of it out of a secret aluminum alloy. This is one-third the weight of steel and cast iron.



With the exception of the sleeve-valves, the entire Daimler motor is made of aluminum alloy.

Sliding Tops for British Cars

TO PROVIDE further novelty, British car manufacturers have introduced sliding tops. It is said that they add materially to riding comfort, giving fresh air without the direct drafts associated with open windows.



Sliding auto tops attract British manufacturers.

Uncle Sam Tracks Winds by Radio

IN ORDER to assure a greater safety in air travel the U. S. Signal Corps has developed a miniature broadcasting outfit that is carried aloft by hydrogen-filled balloons to pick up the trend of upper air currents. A radio compass on the ground detects the course of the balloons as indicated by the radio signals.

How to Market an

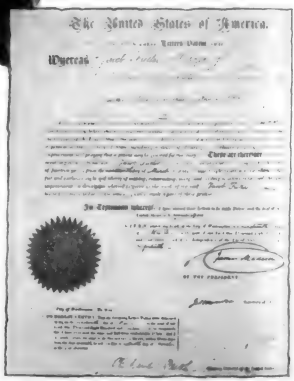
Elihu Thomson and Charles F. Brush, famous electrical engineers, study an early Brush arc-light dynamo which supplied current for the first street arc lamps.

In this, the second of a series of articles dealing with problems of the inventor, Mr. Miller gives pointers on how to put an invention on the market successfully so that it will return a profit to its inventor. If you are owner of a patent on an invention or if you are developing an idea, these articles cannot fail to be of help to you. The third of the series will appear in the May issue.

EMERSON once wrote that the inventor of a better mouse trap would find a path beaten to his door, no matter how deep in the woods he might live. Unfortunately for modern inventors, most people prefer to buy their mouse traps at the dime store.

It isn't enough to invent a useful article. You have to manufacture it, advertise it, find sales outlets, and build up a business before it can begin to earn profits. Good business judgment, which is only a specialized variety of common sense, must back up every invented article which scores a commercial success.

The popular idea that predatory capital is waiting behind every tree to seize and



The President signed all patents issued in the early days of the United States. The signature of President James Madison is encircled; below it is the signature of James Monroe, Secretary of State.

INVENTION

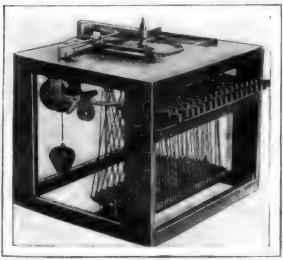
by JAY EARLE MILLER

appropriate for itself the great idea of some poor but struggling inventor, to the end that the emoluments thereof may accrue to Big Business, is far from being true. Actually, capital to invest in new and untried ideas is far from being predatory, being one of the coyest kinds of capital we have. The sales resistance to a new idea in any field, and that includes invention, politics, religion, business, or the science of raising bigger and better babies, is enormous.

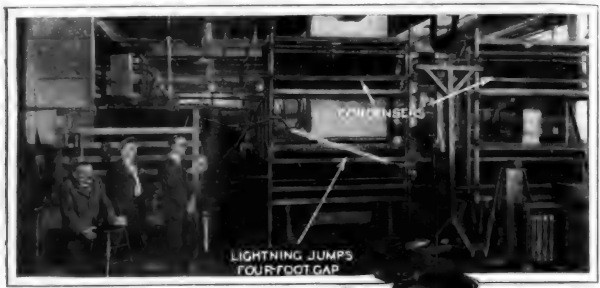
Usually the best field, if any inventor wants to sell his idea outright or lease it on a royalty basis, is among the manufacturers of somewhat related lines. A new automobile accessory, for example, may prove a valuable addition to the existing line of one of the 1500 accessory manufacturers in the United States, particularly as he may have machinery in his plant that is not working to full capacity, and which is capable, after the addition of the necessary dies and jigs, of turning out the new device.

The existing manufacturer is already in the accessory business. He knows the field and knows whether the new idea would exert enough appeal for the average motorist to make him want to buy it. He has his jobber connections, his sales force, and his advertising department, all versed in the science of marketing gadgets to make the old family car a better steed. The new idea can be included in his regular advertising without appreciably increasing his advertising bill. The same factory and office force can handle the additional load. In other words, his overhead would be almost negligible, whereas a new company, formed to manufacture and market the one new device, would need factory, machinery, office, sales

Millions of Stillson wrenches are the lineal descendants of this original model in the hands of Carl W. Mitman of the Smithsonian Institute. It was patented by Daniel C. Stillson in 1870.



Try to type a letter on this machine! It's the basic patent of the Remington typewriter, patented by Sholes and Glidden in the year 1868.



Dr. Charles P. Steinmetz, at left above, invented the first lightning generator, now commonplace in laboratories. Twenty-foot bolts with millions of volts are produced by these machines in experimental work in electrical invention field.

and advertising forces, and then would have to break into a highly competitive field.

If a new company is to be organized, however, the best place for the inventor to enlist capital is in his own home town, among the people who know him best, and who have confidence in his mechanical and business ability to see the thing through.

Marketing an invention is an art in itself, quite distinct from the art of creating it. Creative brains and business brains, unfortunately, have a habit of being found in entirely separate and distinct localities, a human failing that has given rise to the many heart-rending stories of inventors who woke up one day on the outside of a fine factory, looking in to watch someone else make and collect the profits from their brain children.

One inventor who has a long list of successful patents to his credit says he finds it easier to sell half a patent than all of it, even though he charges as much for the half as he would for the whole. The reason is that the purchaser of a half interest feels the other fellow is going to carry his share of the responsibility and worry of putting the thing on the market.

A famous case of the successful sale of a half interest in a patent is told by Gregory J. Spohrer, who holds some seventy patents, mostly in the compressed air field. Spohrer

Note the front wheel drive on this first patented gasoline "buggy," the famous Selden patent which caused much litigation in the early days of the automobile. This model was patented in 1895 by George B. Selden.

and a partner had a small automobile repair shop and the agency for a couple of automobiles in Joplin, Mo., back in the early days of the automobile. He conceived the idea that hand cranking was a waste of time, and invented a compressed air ram and pinion to do the work. That was the first automobile starter. A relative of Woodrow Wilson was interested, and bought half the patent for $10,000 and paid all the development costs. Until the electric starter was perfected the Wilson-Spohrer starter did very well, and while it was doing well the inventor sold the remaining half interest for another $10,000.

Next he built a motorboat starter, fitted one to a Pierce-Arrow engine, and exhibited at the New York motor boat show just before the war. An official of the Curtiss company was interested in the device, invited Spohrer to the Curtiss Airplane fac-

tory, and in a short time he turned out a compressed air starter for airplane engines. Thousands were made during the war for England, Russia and the United States. That was the starter used on Liberty engines. Spohrer made $40,000 out of that invention.

Later he invented a compressor to pump up the giant, oversize pneumatic tires on big trucks—a pump that wouldn't overheat during the job, and followed it with a portable compressor for garages. Up to that time most compressor pumps were built to operate at 300 r.p.m., being geared down from motors turning over at 1725. Spohrer maintained a pump could operate at the motor speed, and when manufacturers and engineers laughed at the idea, proceeded to build them, buy the motors, and sell the completed units at half the price of the old fashioned geared-down type.

The first electric motor patent issued in the United States went to Thomas Davenport in 1837 for this model of "a device for propelling machinery by electro magnetism."

Going back to the problem of what to invent, the newcomer in the game can get some good ideas by studying the success, or lack of it, of things already on the market. It is an axiom of inventors that the small and inexpensive device will earn larger profits than a complicated machine. That is not always true, for the statement must be modified by considering the demand and the selling price, but it is true to the extent that the inventor of small means has a better chance to make and market an article costing a few cents than he has to finance a highly complicated machine.

Model of an early miner's safety lamp, invented by George Stephenson.

More money has been made out of can openers — an article found in every kitchen—than will ever be made out of the elaborate electrical machines invented to register and count the votes in legislative assemblies. The profit on the one may be a cent or two, and on the other it may be thousands of dollars, but after every legislative body in the world has been equipped the number of vote recorders in existence will be less than the number of can openers in one fair sized village.

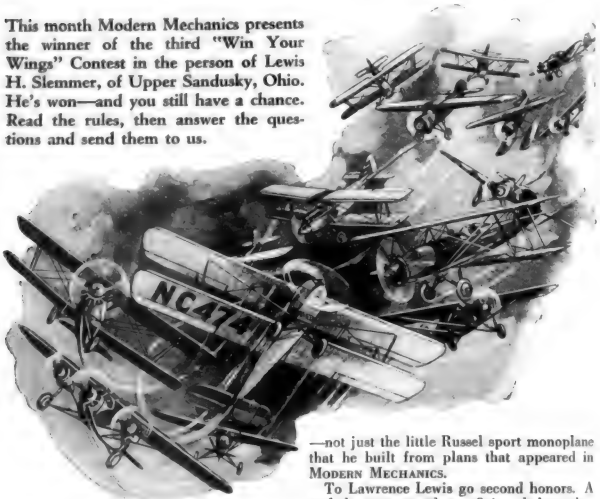
On the other hand, the automobile is a glaring example of the money that can be made from a highly expensive machine—when the time and labor saving through its use offsets the price, and the number of potential customers is limited only by the number of families in the country.

There is another factor that enters into the normal superiority of simplicity over elaborateness, and that is that the average inventor, handicapped by lack of funds and tools, has more chance of producing a simple and inexpensive article that will work than he has of turning out an elaborate mechanism. It's a pretty safe bet, therefore, for the beginning inventor to concentrate on something simple.

Next month—How to be a Successful Inventor.

He's Won His Wings

This month Modern Mechanics presents the winner of the third "Win Your Wings" Contest in the person of Lewis H. Slemmer, of Upper Sandusky, Ohio. He's won—and you still have a chance. Read the rules, then answer the questions and send them to us.



THE winnah, ladies and gentlemen, of this here Flying Contest Numbah Three is Lewis H. Slemmer, 36-year-old-flying enthusiast of Upper Sandusky, Ohio! He gets a ten-hour course in flying and wins his wings!

Give him a great big hand, everybody, because he certainly had some real tough opposition for first place. More than 4000 men and women, boys and girls tried to wrest the honor of winning away from Lewis. But he's "in" and will start for the airport and his flying lessons just as soon as he can get ready. Every cent of his expenses will be paid for him. He doesn't have to worry about railroad fare, living expenses or other costs incident to the flying course. Even a helmet and a pair of goggles will be supplied him. And, when he's through he'll be able to fly any ship —not just the little Russel sport monoplane that he built from plans that appeared in MODERN MECHANICS.

To Lawrence Lewis go second honors. A real honest-to-goodness flying helmet has been sent to him at his home in Manhattan, Kansas. He is a 22-year-old student of electrical engineering and plans to make airport lighting his life's work.

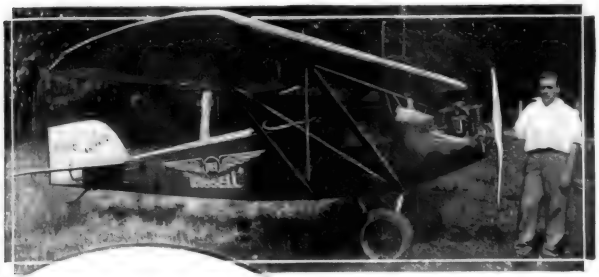
And to Tom Sprague, 30-year-old Texan, the Editors have sent a pair of goggles, emblematic of third place in Flying Contest Number Three. Sprague hails from Dallas, the home town of Robert L. Dumas, who took first honors in the second contest.

Now then! A word to those who've lost —and likewise to those who've never tried their hands at winning the ten-hour flying course offered monthly by MODERN MECHANICS.

Those who have already participated know that the contest is not a "sticker" for the questions are comparatively easy. To newcomers we can only say it is simple.

Here is all you have to do. Look through the advertising section of this issue and find

YOU CAN BE NEXT!



Lewis H. Slemmer, winner of this month's "Win Your Wings" contest, has built this Russel-Henderson monoplane from plans that appeared in Modern Mechanics. He is shown here proudly displaying the ship that he'll soon be able to take into the air.

RULES OF THE CONTEST

Scattered through the advertising pages of this issue of Modern Mechanics you will find six questions dealing with aviation. For the best letters containing answers to these questions, as determined by the contest judges, prizes will be awarded as announced elsewhere on this page. Neatness, originality, and adequacy of answers will be guiding factors which will help the judges determine the winners. It is not necessary for you to have built an airplane of your own to win!

Anyone may compete who is 16 years of age or over, and a resident of the United States or Canada. Members of the staff of this magazine are, of course, not eligible to enter. Address your letter to Flying Contest No. 7, Modern Mechanics Magazine, 501 Seventh Avenue South, Minneapolis, Minn. Entries must be postmarked not later than April 15, 1930, to be eligible for this contest. Clip or copy the entry blank below and attach it to your letter. Fill in the information requested. Include a snap shot of yourself, if possible—a big photo isn't needed; just a kodak print.

It is not necessary to buy a copy of the magazine to compete. In case of a tie, duplicate prizes will be awarded. Fill in the entry blank, find and answer the six questions, and send in your entry now. Don't forget to include your photo!

Entry Blank

My name is .....

Address .....

City ..... State .....

Age ..... Height ..... Weight ..... Sex .....

If under 21, please answer the question below:
Will your parents consent to your learning to fly?

Parent's signature .....

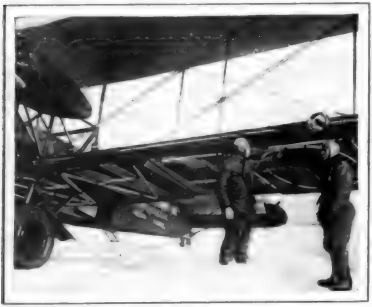
Attach your answers to the six questions, and your photo, to this blank. Mail before April 15, 1930, to

FLYING CONTEST NO. 7
MODERN MECHANICS MAGAZINE,
501 SEVENTH AVE. S.
MINNEAPOLIS, MINN.

the six questions pertaining to aviation. Answer them to the best of your ability and send your answers to us together with the entry blank and a snapshot of yourself. You don't have to know a thing about building a plane or what makes it fly. Neatness, originality and adequacy of answers will be the determining factors in selecting the winner. As the age limits for pilots' licenses is sixteen, MODERN MECHANICS sets its age minimum at sixteen. Sex makes no difference for in previous contests the girls have shown their knowledge of the air by submitting prize winning answers. Try your luck. Who can tell, you may be the next to study flying at our expense. The contest closes April 15, 1930 at midnight, so you have ample time to get your answers ready.

Enter the contest this month. And if you don't win this time try again next month. There are still five more awards to be made after this. Just because you participated once does not bar you from trying again. That gives you several chances to win! Don't pass up this opportunity. Remember—this contest closes April 15, 1930 and that your entries must be postmarked not later than midnight of that day. Come on in—the air's fine!

Rohlfs Invents Neon Advertising For Use on Airplanes



Roland Rohlfs, inventor-pilot at left, explaining neon advertising to his relief pilot, Albert Matlack, at Chicago Field.

ROLAND ROHLFS, inventor-pilot, is shown at left, pointing out the latest development in aeronautic advertising. Equipped with neon tubes on the underside of the wings this ship recently arrived in Chicago to do pioneering work in this type of publicity.

Rohlfs and his relief pilot, Albert Matlack (right), are enthusiastic in voicing the future of airplanes for advertising purposes. And, like the industry, the surface has only been scratched. Development will bring out other ways of using the airways for promotion. There will always be something new for advertisers, much the same as other publicity and advertising stunts created by the folk "on the ground." Rohlfs' plane is the first equipped with neon tubes but expectations are that their use will be common before long.

The Skipper Wins College Award

THE resourcefulness of the college student apparently knows no end. Below is the "Toonerville Trolley that meets all trains"—a reproduction of Fontaine Fox's cartoon—which was the winner of the first prize in the "peerade" section of the Kake Walk and Annual Carnival held by the students of the University of Vermont. The trolley was complete down to the skipper. Even the pet raven occupied his place atop of the "ship" until the battery of cameramen became too persistent in their request for special poses.

Prize-winning "Trolley" of a Vermont student.

Stones Used to Save Road Markers

How Oregon protects fresh paint on highways.

BY PLACING stones at intervals along newly painted road curve markers, the Oregon State Highway Department has succeeded in working out a plan to assure a dry paint job before cars are permitted to drive over it.

Philadelphia Police Have Prisoners Confess to "Talkie"

THE police have now adopted the sound motion pictures for recording of confessions made by prisoners. When the police present such evidence of confession in court there can be no claims of brutality in forcing a confession for the prisoner will be clearly shown by pictures as he tells of his crime. Such a method of recording a confession was recently used by the Philadelphia police in the case of Harold Roller, milk wagon driver, who told of committing 21 house robberies. The pictures showed that the prisoner was calmly and freely clearing the slate.

Harold Roller, seated at left, shown confessing to "Talkie."

New Playing Cards Are Round

These cards, slightly elliptical in shape, are easier to play with, it is claimed in London.

Mysterious Rays from Onion Roots

THE existence of mysterious "onion rays," first reported by the Russian biologist, Dr. A. Gurvitch, but regarded dubiously by many experts, has been confirmed by the Swiss biologist, Dr. Andre Naville. Taking from the eye of a frog a tiny bit of the living tissue of the front transparent membrane or cornea, Dr. Naville finds that the living cells of this tissue will continue to grow and divide for a time in a suitable culture solution. The rate at which these cells grow and divide can be measured. Near this detached mass of growing cells, Dr. Naville then places the tips of some growing onion roots. Immediately the rate of growth of the cells in the frog-eye tissue speeds up, as though some stimulant were reaching these cells.

Non-skid Pontoons Used by Motorcyclists Crossing English Channel

H. S. PERRY and W. E. Thacker, of Birmingham, England, used a home-made ferry for a trip across the English channel. The device consists of two parallel "non-skid" pontoons with the double-seated motorcycle mounted on a frame between the floats. A belt from the rear driving wheel is attached to a bevel gear which turns the propeller. The unique craft develops a very satisfactory speed.

H. S. Perry and W. E. Thacker at outset of channel voyage.

"SHOOTING" LIONS for

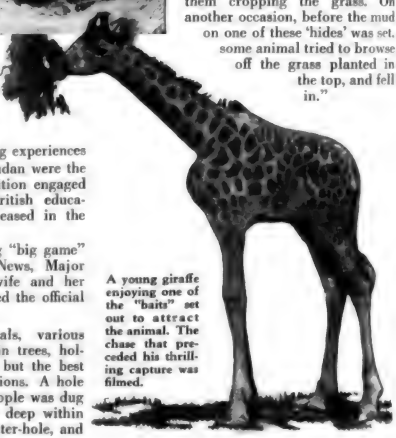
Mrs. Court-Treatt and her brother, Errol Hinds, carrying a camera into their hideout in the Western Sudan where these wild animal pictures were taken.

was roofed with poles and grass like a native hut. This grass roof was then covered with mud taken from the water-hole, and the 'hide' was carefully modeled exactly to resemble an ant-hill. Grass and small bushes were planted in while the mud was still wet, so as to make it completely realistic. Four small windows were then cut in the walls for the lenses of the cameras. On one side of the 'hide' steps were cut, and, when we and the cameras were inside, a bundle of grass was pulled over the hole to camouflage the entrance. These 'hides' were found to be cool and comfortable, and did not seem to allow any human scent to escape. The game appeared to be entirely unsuspicious of them, and quite shy animals would approach. Once, just before dawn, buffalo came so close to the 'hide' that we could hear them cropping the grass. On another occasion, before the mud on one of these 'hides' was set, some animal tried to browse off the grass planted in the top, and fell in."

TWELVE months of thrilling experiences in the wilds of Western Sudan were the lot of the Court-Treatt Expedition engaged in filming "Stampede"—a British educational picture soon to be released in the United States.

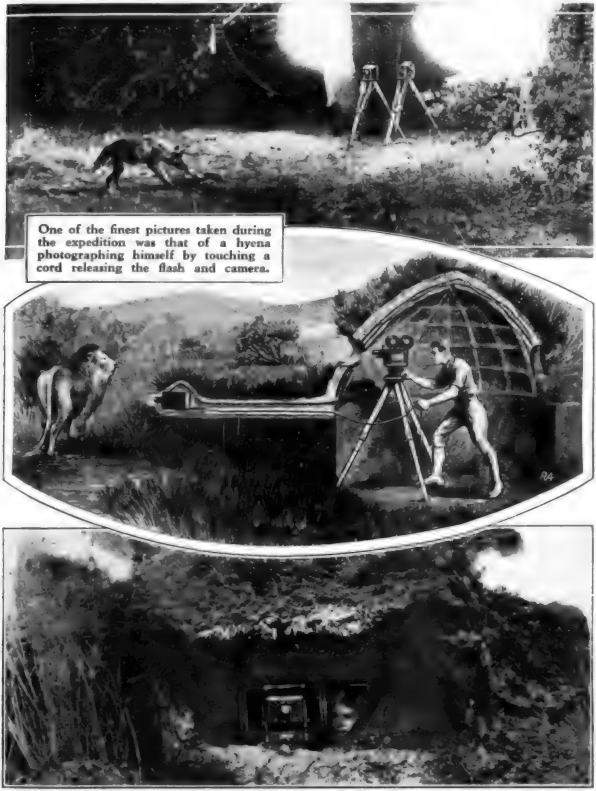
In detailing his year filming "big game" for the London Illustrated News, Major Court-Treatt, who with his wife and her brother, Errol Hinds, comprised the official personnel, said:

"For photographing animals, various 'hides' were used—platforms in trees, hollowed-out bushes, and so on; but the best was that shown in the illustrations. A hole big enough to contain three people was dug in the ground about four feet deep within about 100 feet of a suitable water-hole, and



A young giraffe enjoying one of the "baits" set out to attract the animal. The chase that preceded his thrilling capture was filmed.

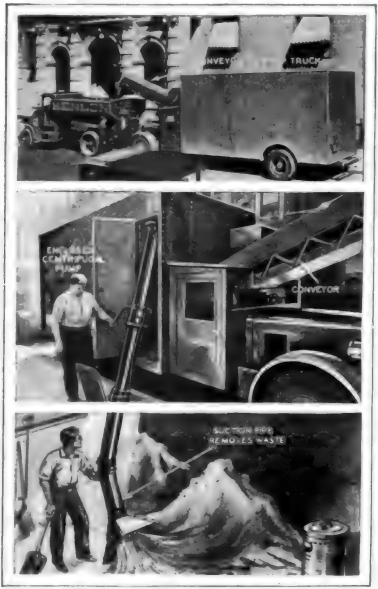
African MOVIE Thriller



One of the finest pictures taken during the expedition was that of a hyena photographing himself by touching a cord releasing the flash and camera.

The picture, "Stampede", made by the Court-Treatt Expedition required twelve months to make. Various "hideouts" were used to get these unusual pictures. Platforms in trees, hollowed out bushes and other forms all played their part but the one most used was the structure carefully modeled to resemble an ant-hill, a cross-section of which appears above. They were spotted by a water hole.

Conveyor Handles Tons of Waste by Suction Method



Successful in New York, these pneumatic conveyors spell doom to waste cans. Suction generated by a centrifugal pump mounted on a truck draws waste into an accompanying truck.

THE advent of the electric-pneumatic suction system, which picks up ashes and waste material with a minimum of labor and without dust is a development of today. The giant suction reaches from the truck, which transports the machine, to the bin, and draws the waste up.

The conveyor consists of the truck, containing a hopper into which waste is drawn by suction, and from which it is conveyed by belt-conveyor to a carrier-truck. The truck is gas-electric-driven and power for operating the suction and conveyors is obtained by connecting the generator to the motor and running the engine at suitable speed. Several machines have been installed in New York and have proved so revolutionary that other cities now contemplate adding them.

Suction is provided by a centrifugal compressor, rated at 6,000 cubic feet per minute, at a speed of 3,500 revolutions per minute, and operated by a 40-horsepower motor. The truck is equipped with piping capacity permitting a suction of 2,800 cubic feet per minute, equivalent to a velocity of 145 feet per second in the intake pipe

Aside from removing waste the equipment may be used in unloading coal barges.

New Type Combination Brush and Mop Holder Invented by Clement

SAID to be the quickest operating brush and mop holder invented, a new holder in which a brush can be attached five times as rapidly as it could be in other kinds, has been invented by B. C. Clement, Elmwood, Wisconsin. It holds any straight-edged brush from two inches to three inches across, and has a simple spring lock to hold the lever to the handle. This lock slips through a slot in the center of the top of the lever, a feature which is of outstanding service, because the common mop-stick has a bothersome feature of having the lever spring open while the mop is being used. This causes inconvenience and loss of time to the user.

Quick operating mop and brush holder saves time and temper.

One-Cylinder, Five-H. P. Cycle Car Wins Favor in Paris

IN PARIS, not unlike all cities facing the perplexities of traffic jams and the need for speedy, economical transportation, an ingenious inventor has created a small, high-speed, two-passenger cycle car that has about all the things necessary—fast, economical and convenient transportation facilities.

This cycle car was recently exhibited at the Grand Palais. It is powered with a single-cycle motor of five horsepower and is capable of a speed of 90 kilometers an hour. It is operated by a chain drive on the rear wheels and will carry two passengers with ease.

With a speed better than 50 miles an hour, the cycle car shown above provides convenient economical transportation.

Novel Fire Escape for Hospital

Hospital patients, strapped to their mattress, drop down this chute to safety.

THE safety of patients in case of fire or any other emergency is always one of the first considerations of hospital officials. Particularly interesting is this odd, spiral fire escape attached to the rear of a western hospital.

In the event of fire or other need for quick evacuation of the structure, patients are strapped to their mattress by means of a belt attached to it. As the chute is wide enough to take an ordinary hospital mattress, it is comparatively easy to transport patients to safety without removing them from their beds. Once on the ground, attendants carry them to temporary quarters.

The chute, as can be seen from the illustration, is accessible from every floor where landings have been provided. It is of sheet metal construction and rugged enough to meet any load demand.

Television Makes Further Gains

THE advance toward practical use of television is continuing along broad lines. Every day sees the development of new ideas and thoughts keeping pace with the demands of "us moderns" for the new.

Scanning drum and neon glow tube of the Jenkins Televisor. The motor is directly under drum.

Foremost in the ranks of television pioneers are the developments of C. Francis Jenkins and his associates. The accompanying photograph shows engineers examining the scanning drum and the neon glow tube.

Miracles of Mechanics

Pilot Ballough superstitiously refused to use his seat strap or goggles. His plane stalled at the top of a loop. Hanging to the stick he pulled it out, losing it earthward. He crashed against a telephone pole, landing only slightly injured.

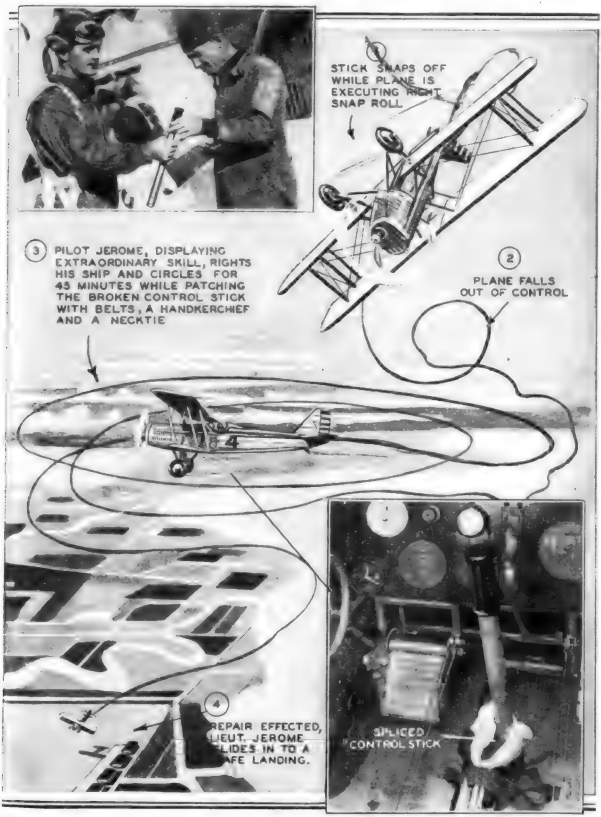
Jack Trask of New Jersey was helping hold a plane for the warm up. He didn't hear the call to clear, hung on, and rode seven miles on the tail group, landing with the plane, unharmed!

THESE miracles of mechanics pictured here actually happened—the pilots and people concerned came through their hair-raising adventures unscathed! From time to time MODERN MECHANICS will illustrate kindred adventures depicting miracles which have happened in the realm of man's mechanical activities — informative, laughable, and unbelievable incidents one might ascribe to a famous liar like Baron Munchausen if eye witnesses and disinterested observers had not verified them. Above, Jack Trask rode seven miles, unharmed, on the tail of a plane. He was assisting the

(Continued on page 188)

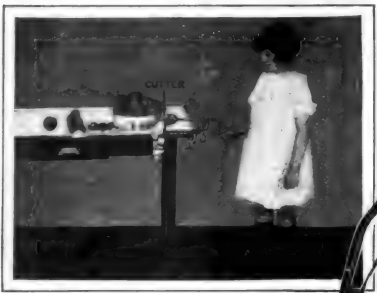
James Hendrickson out on Montana's prairies, cranked his Heath Parasol with throttle open. It bowled him over and flew away, flying five miles and landing perfectly when the motor slowed down.

No. 1--Narrow Escapes in the AIR



Big planes, high powered, take two hands and brawn to fly them. Imagine the consternation of Lt. Clayton C. Jerome, Marines, when his metal stick broke in a violent snap roll. Jerome frantically ruddered into a spiral, spliced the stick with necktie and belt, landing safely with makeshift repair.

Housekeeping Made EASY



So simple that even a child can operate it, this new slicer handily cuts vegetables for cooking.

MILADY these days demands the latest and best in household mechanics. Any device which fills the function of providing an easier, quicker and better way of doing some standard household task finds a ready market.

Inventors have been busy this year, and have developed many new things, among them the very clever devices pictured on these pages.

All-glass electric percolator shows just what stage of cooking beverage is in.

For instance, there's the old task of "dumping the vacuum cleaner sack." Mussy, at best, and dirty, too. It involved the careful detaching of the neck of the sweeper sack and the arm-length carrying of the contents to some out of the way corner of the backyard or ash cellar where it would roll forth its clouds of electrically gathered dust.

A new way for cleaning these sacks has been found. Zippers are used to open the sack. The cleaner is placed over a dust pan on a sheet of newspaper, and zip! The dirt falls out. No such muss and inconvenience as the old method entailed.

Mussy—that describes the old task of cleaning the sweeper sack. Thanks to zippers milady now opens the bag and the electrically garnered refuse falls into a dustpan.

Hard to peel potatoes? Irksome? Not with the kitchen table fruit and vegetable slicer pictured above. Let the kiddies do the work for the fun of it. The device has recently found favor in large metropolitan markets and can be made to peel or slice fruits and vegetables.

How'd you like a small electric stove for light cooking? Depicted here you will see a new model built especially for the city apartment dweller. It is unique in that it is built of many detachable ele-

by Clever New Knick-Knacks

ments so that it can be piece by piece put into the daily dishwashing program, and thus retain the spotlessness which is the pride of the housewife.

Suburban home owners will welcome the incinerator pictured below which is especially built for backyard operation in place of the old blow-about wire cage. Deposit the refuse you wish to dispose of, drop a match, and nature herself will dispose of the waste matter. Garbage, dust and old papers can thus be done away with.

Small suburban homes will welcome this backyard incinerator which does away with all household refuse.

One new development which is a novelty in the line of table top electric appliances is the new all-glass percolator, heated with the usual efficiency of the electric element.

Another novelty is a metal cabinet

This easily cleaned electric stove has detachable elements which may be removed and scrubbed spotless.

installed above the kitchen sink to hold all the necessary scouring powders, dishwashing brushes and helps to household cleanliness.

On the market for some time have been the electric dishwashers which every housewife has at one time or another dreamed of. Reports coming to the editorial offices of MODERN MECHANICS state that at last the process has become fully automatic. One puts in soiled china and the machine delivers it dried!

And here's an all metal auxiliary to the kitchen sink which will carry all the tools and soaps for efficient dish cleaning, conveniently at hand just when they're wanted.

Simple Modern Furniture

by JAY EARLE MILLER

Contemporary mode favors design in blocks, masses, angles. These articles of furniture for the home man's study fill the bill to perfection, and straight lines make them easy to build.

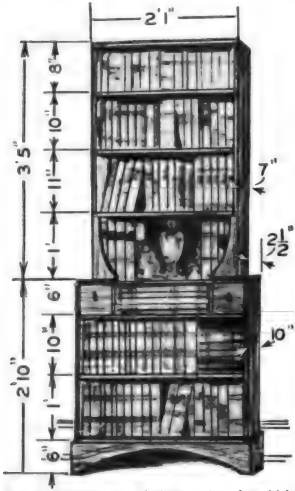


Fig. B. This bookcase, full dimensions for which are given in the drawing above, has no filigree work of any kind—no dados, mortises or doweling. It is simple, square, rugged, serviceable.

AN INTERIOR decorator—with a flair for toying around with basement-workshop tools — designed these modernistic bookcases and desks. Today, they occupy a prominent place in his combination study-library-living room—built out of the waste space in his attic. They are made of plywood and some half-inch lumber with a few heavier pieces thrown in to give added strength. The finish is brushing lacquers in bright colors. Incidentally, Mrs. Interior Decorator quickly appropriated one of the bookcases because she thought it made an excellent and much needed china cabinet for her dining room.

For convenience in referring to them the bookcases have been called A and B and the desks D and E. The proportions of all the pieces are designed to produce attractive results, but may be changed to suit individual requirements, and to fit into special nooks. Half-inch lumber unless otherwise specified. is used throughout, to give the light and graceful appearance so typical of most modern furniture.

Poplar Takes Lacquer Finish

All four pieces have been cut away at the base in the rear to fit over the baseboard and quarter round moulding, giving a tight fit against the wall, is used. Backs of half-inch lumber are used, but can be omitted, if desired. Bookcase A requires two ends seven feet 2 inches long, cut from 12-inch widths of half-inch lumber. Poplar is excellent, as it usually dries better than pine, and therefore is less subject to warping. Too, it is easy to work and takes an excellent lacquer finish. The four-inch baseboard, with the top edge beveled, also is cut from half-inch material.

The balance of the construction details are simplicity itself. The spacing of shelves, the construction of the "cubby-hole" near the top and the manner of setting the door to the lower cupboard in place are easily followed by studying the illustration.

The other bookcase stands six feet and three inches high. It consists of a base that is two feet, ten inches high and the upper unit which is three feet, five inches over all.

The base is assembled first, with ends and top 10 inches wide, three shelves as shown, a base similar to that in the first case, but with an ornamental opening cut in the front, a back and two small drawers. The upper part is only 7½ inches deep, and

is assembled and mounted in the same way. The construction and dimensions are clearly shown in the drawings.

The larger of the two desks, the one marked *D*, is interesting for the amount of work and storage space it provides, with its telephone cabinet, bookcases, drawer and storage cabinet at the right, and book shelves and stationery cabinet at the left. The desk is two feet and two inches deep overall, making the top two feet and one and one-half inches, after deducting the one-half-inch back. The desk top itself is four feet and three inches long, giving nine feet for the bookshelves down either end. The top is made of 1⅛-inch lumber, glued together. The ornamental end at the left, and the ends of the storage cabinet at the right are of the same thickness, to give a firm support.

The drawer and cabinet front, the drop lid of the stationery cabinet, and the door of the telephone compartment are of one-inch boards, the two doors being battened on the inside, while the drop lid has one-foot by one and one-half-inch end strips, as shown. When lowered the lid provides additional desk space. Details of the shelves and stationery rack, both made from quarter-inch veneer, are shown in the sectional drawing. The wastebasket is made of plywood or half-inch lumber. The bench is three feet long. Other dimensions are shown in the drawing of the end.

The other desk is suitable for a school child. It provides bookshelves in either end and on top, a stationery and supply cabinet, with a drop desk lid and three drawers. Dimensions and details are shown in the drawing, while the construction utilizes the same joints as shown for the other pieces. The drop lid is built up of 1-inch boards, mortised into one-inch by one and one-half-inch ends, to give a rigid surface when used as a desk.

The ornamental wrought iron strap hinges can be obtained from any hardware shop, although here again, the home craftsman might get a kick out of designing his own. It requires a bit more in the way of tools but then it is worth while doing for it represents one's own handi-

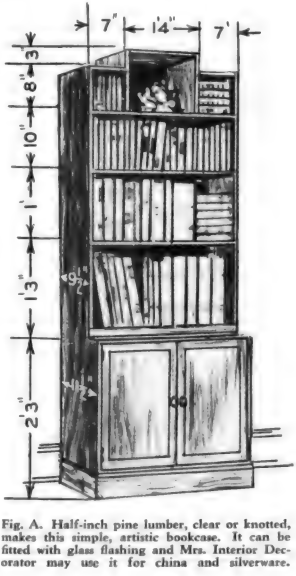


Fig. A. Half-inch pine lumber, clear or knotted, makes this simple, artistic bookcase. It can be fitted with glass flashing and Mrs. Interior Decorator may use it for china and silverware.

work. Perhaps the local blacksmith—if there is one left in this day and age of motorized travel—can be induced to let you use his equipment. As a rule they are jolly folk who do a thing or two like that to vary the monotony of their everyday work. Try it sometime, anyway.

Now then, on the question of finishing. As has already been said, finishing lacquer on plywood or poplar is about the best that you can get for these "jobs." The selection of the color, however, must be left to personal preference. Much depends on the color scheme of the room and the tastes of the individual. Black and red are

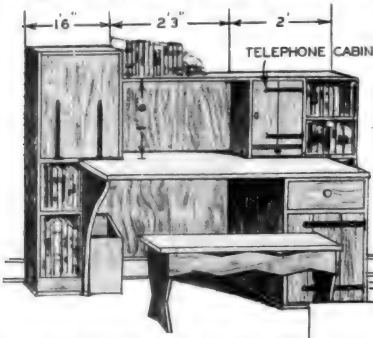


Fig. D. This design, which really amounts to an artistic grouping of simple boxes, is a most useful desk, bookcase, hold-all and phone bench. Straight lines simplify building.

two shades that seem to predominate modernistic furniture. Sometimes the two are combined into a harmonious whole. But before you start painting—here is a suggestion that may save some grief later on. Take a few pieces of the wood you have left over and paint them up the way you think you would like to have your furniture. Play around with it a bit. You'll find that sometimes your thoughts on color and color harmony are far from the point of perfection when you get your paint brush in hand.

If you want to keep the wood in a natural finish, give the bookcases and desks a thorough sand-papering when you have them assembled and then give them a few coats of shellac or varnish. A bit of oil rubbed into the wood before you brush on the varnish or shellac will bring out the grain a bit and add something to appearance, too.

But desks and bookcases do not complete the furnishings for the ideal attic study. There are a host of other things that the handy man can work into his general scheme of things.

Take a radio cabinet, for instance. That can be patterned much after either one of the desks. The chassis of the set can be set right into the central cabinet and the balance of the desk—that is, the shelves—can be used for books or papers as in the case of the original design.

Then there are wastebaskets, too, that can easily be made from plywood and decorated to fit into the picture. Or a sewing cabinet or side table can be made. There are a thousand and one different things.

Although this discussion covers modernistic types of furniture for use in a den or library there is one suggestion that I think it will not be amiss to make before we "sign off" on this article. And that is that if you contemplate using your attic for more than a store room—that if you are going to try to make it into some place where you can live and work—be sure to get plenty of re-enforcement between your wood or beaverboards and the roof and walls.

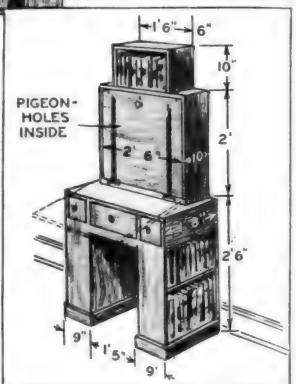
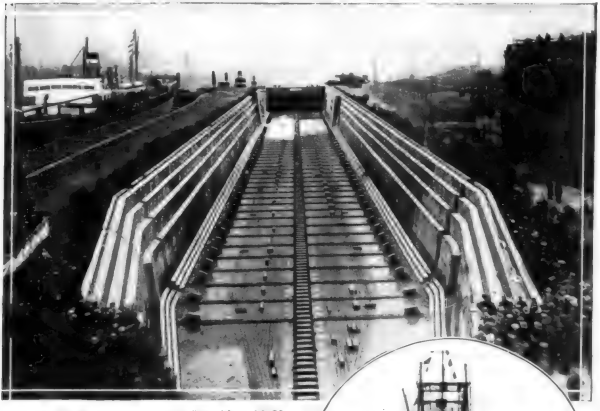
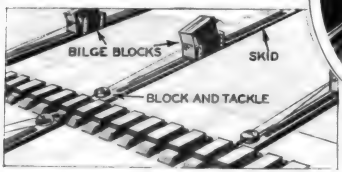


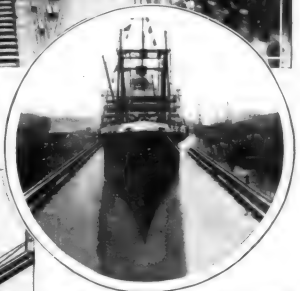
Fig. E. A most convenient desk for the school child can be made after this design. No waste space, and the charm of the floor end book racks is enhanced by the wrought iron hinge work.

Room for Two Ships in Brooklyn Dry Dock



The new Todd graving dock in Brooklyn, N. Y., the largest privately owned dry dock on the Atlantic Seaboard, photographed "dry" just before the dedication ceremonies. The operation of the bilge blocks, running along skids and operating by block and tackle, is shown below.



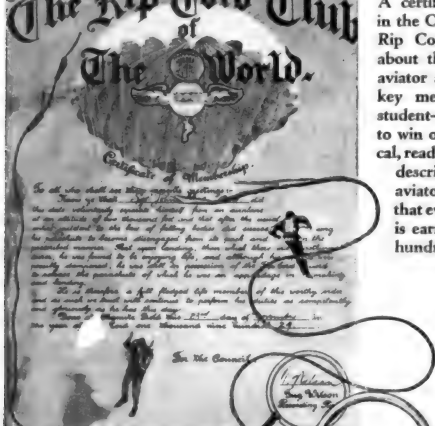


The Southern Cross, the first ship to enter the recently opened graving dock.

THE largest privately owned graving dock on the Atlantic Seaboard was recently placed into operation at Todd's shipyards in Brooklyn, N. Y. It is gigantic in size and has an overall length of 750 feet. At the height of the keel blocks it is 90 feet wide. The top width is 120 feet. The new structure has an outer gate seat and an inner gate seat and can accommodate two vessels at one time. Centered as it is in the very heart of New York the need for adequate dry dock facilities has long been felt. This unit is but the first in a program of expansion that will ultimately bring to New York the finest in marine equipment.

When full the dock contains more than 16,000,000 gallons of water which can be pumped out in less than two hours. The capacity of the pumping equipment is 200,000,000 gallons a day. The new dry dock will enable the Todd company to dry dock 175,000 tons of shipping in one day—a capacity not exceeded by any other ship yard in the world.

Some "Nutty Clubs"



A parachute rip cord, as shown at the right, is the insignia of membership in the Rip Cord Club of the world, earned only by parachutists who jump from an airplane and come down to earth holding the rip cord in their hands.

A certificate of membership in the Caterpillar Club or the Rip Cord Club means just about the same thing to an aviator as a Phi Beta Kappa key means to a university student—and it's just as hard to win one! If you're skeptical, read this interesting article describing odd clubs of aviators, and you'll agree that every "diploma" issued is earned by its recipient a hundred times over.

YOU'RE two thousand feet up in an airplane, with an eighteen-pound packet of silk on your back which you hope is going to let you down to earth safely. If the 'chute shouldn't open—but you can't think of that; you're up there to make a live jump from an airplane, and you've got to go through with it. The pilot throttles his engine and smilingly indicates that it's time to go overboard. The old law of self-preservation dies hard, but the pilot's unfeeling grin shakes you up like a sock on the chin, and you hurl yourself toward the ground with that "all-over" feeling which comes to anybody making a parachute jump for the first time.

One—two—three—four—five! You pull the rip cord, and for a moment hang dreadfully alone in space. Suddenly comes a swish of silken shroud lines, followed by a bang as the parachute opens. You've been falling head first, and you are snapped upright with a suddenness which leaves you a little groggy. After that it's easier; you just float gently to earth. And when you get there, and slip out of your harness, you discover that the rip cord is gone. What happened to it? Well, you must have dropped it after it had served its purpose; you don't quite remember—everything happened rather suddenly. But having lost the cord, you're barred forever from membership in the Rip Cord Club of the World.

The Rip Cord Club is second only in exclusiveness to the far-famed Caterpillar Club. The latter is composed of flyers who have been forced to jump from an airplane to save their lives, and numbers Col. Lindbergh as its most famous member. The Rip Cord Club is made up of students in the Army Parachute School at Chanute Field, Illinois, who make their first parachute jump

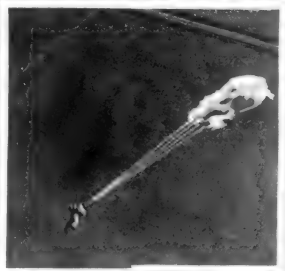
of the SKY JUMPERS

and come down with the rip cord in their possession. The Club was originated by an Army sergeant who became discouraged at the rapid turnover in rip cords, and decided that chaps who came down with the cords in their hands deserved some sort of recognition.

The whole trouble is that once the cord has served its purpose in releasing the parachute, it is entirely loose from the pack, and the only way of keeping it with you is to hang onto it going down. If you think it's easy, with everything happening at once and your heart in your throat, try it once—then you'll understand that membership in the Rip Cord Club is a real testimonial of cool-headedness.

Almost everybody has heard of the Caterpillar Club, to be a member of which is to be numbered among aviation's elite. Membership does not come simply by leaping out of an airplane in a parachute; the jump must be necessary to save your life. Its name is derived from the habit of a certain species of caterpillar, which lets itself down from a tree or bush by a self-spun thread of silk.

First stage of a jump—Just leaving the plane, before 'chute is opened.



Second stage — parachute is just opening out as the air begins to fill its folds.

Less well known is the story of the first jump with a parachute of the type which has saved the lives of the hundred-odd members of the Caterpillar Club. The leap was made by Leslie L. Irvin, inventor of the 'chute which bears his name. It all happened ten years ago, when parachutes were generally considered unreliable, and when a free jump from a plane, in which the 'chute was opened by the jumper after he left the ship, was unheard of.

Last and happiest stage—The Happy Landing. Note legs of the jumper in position to absorb the shock of coming to earth. Parachute can be steered to a certain extent by the jumper.

It took considerable arguing on Irvin's part to win the consent of Army authorities for the trial jump, even after dummy tests had proven satisfactory. Officers regarded Irvin's proposal as a sure means of suicide, but he finally won their consent.

Up went the plane carrying Irvin to the desired height of 1500 feet. From the cock-

High Tension Wires Nearly Electrocute Jumper After Successful Leap

"Spike" Hardy, parachute jumper, narrowly escaped death when he came down in a maze of electric wires carrying 60,000 volts. He slipped from his harness and dropped safely to earth. In the insert is the insignia of the Caterpillar Club, a gold pin worn on the lapels of its members.

pit a dark figure rose, leaped, dropped from the plane at express-train speed. Only a few moments now, in the minds of the spectators, before the crushed body of this foolhardy young inventor would be picked up from the earth. Neither the anxious pilot in the plane nor the crowd below could lift a finger to avert the tragedy which impended.

But suddenly a speck appeared above the falling figure, and the parachute hemisphere promptly mushroomed out. It was Irvin's misfortune to be caught in a downward current of air which rushed him to earth faster than normal speed with a parachute. He broke his left ankle on landing, but the experiment was successful. The first live jump had been made.

Just who chose the name for the Caterpillar Club and first conceived the idea of forming a fraternity for persons who have outwitted death through the agency of the silkworm, does not seem to be known. The term was first used about the time Lieut. Harold R. Harris saved himself at McCook Field on October 20, 1922. Ironically enough, Leslie Irvin, whose invention made the Caterpillar Club possible, is not himself a member, for though he has made countless jumps from planes and balloons, he has never had to leap to save his life and consequently does not qualify for membership.

One of the most spectacular figures in aviation circles is Dick Grace, the famous movie stunt flyer, whose sensational crackups before the camera qualify him for exclusive membership in a daredevil's club of his own which might fittingly be called the Suicide Club.

His closest call came on the Fourth of July, 1927, when he decided to enter the California-Hawaii flight contest. He was familiarly known then as the "Broken Necked Flyer." He took off at dawn, and while still near the take-off point the tail

of his monoplane developed an alarming flutter. Grace headed it back toward the beach runway and it nosed earthward at breakneck speed. He managed to hold the plane under control after a fashion, but it struck a fringe of bushes on the edge of the field. The fuselage and one wing were smashed, but with true Dick Grace luck, the stunt flyer stepped out unscathed.

Nearly forty times in the past nine years Grace has crashed planes into unrecognizable heaps of wood and steel, and in all those instances he has come out of the wreckage more or less whole. He bears scars of his profession, of course. Sixty-eight bone fractures are charged up to his dangerous job. His spine has four broken vertebrae. He has been confined to a hospital bed in a state of paralysis for five months. Nevertheless, he keeps right on getting into more smashups. It's his business, and he is perhaps America's greatest glutton for punishment.

The end of a perfect day for Dick Grace, movie stunt flyer, who isn't happy unless he has added another plane to his impressive list of crack-ups. Dick's daring has brought forth the suggestion that he be nominated as sole member of "The Suicide Club." He has been cracking up planes since he was 16.

He takes a few precautions, of course. In starting out on a crack-up flight, he wears an ordinary leather coat, unpadded, just like any pilot. But his helmet is extra heavy and he is strapped into the cockpit with a special belt so that he cannot be thrown out by the crash. The belt is made to break with a strain of 650 pounds; surgeons have figured that if it were made stronger, a rib might be likely to crack.

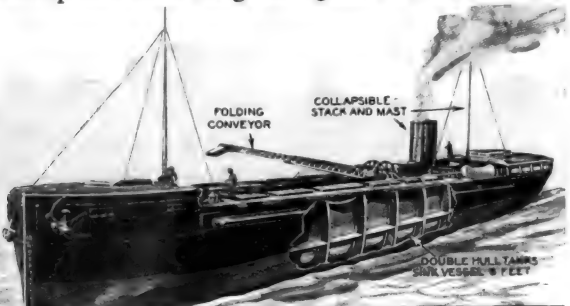
Just inside the cockpit is a special cage built of thin steel tubing so the plane can't crush him when it cracks up. His head sticks up out of it. But just at the moment of the crash he ducks down so that he is practically all inside the cage. He learned the value of ducking his head during the filming of "Wings" when he crashed on a field studded with heavy posts. The plane somersaulted several times, mowing down seventeen of these posts in a row, and Grace ducked just before the third roll-over of his ship.

Later on he discovered that one of the posts had impaled itself in the plane. It was just eleven inches away from where his head had been, and it would have lopped off said head if he hadn't ducked. All in the day's work!

But much as we may envy these thrill-builders of flying, maybe it's just as well that we ordinary folk don't aspire to steal the laurel wreaths from their brows. Sooner or later our workaday hearts would be pretty sure to give way under the strain.

Leslie L. Irvin, inventor of the parachute bearing his name, is not a member of the Caterpillar Club, but no one will deny his right to be called its godfather, by reason of his invention.

Self-Propelled River Barge Designed to Duck Bridges



The "Material Service," new cargo boat designed and built for use on the Chicago River. It "ducks" under bridges, and through application of the submarine principle can be raised or lowered in the water to meet head-room requirements. The double hull tanks, when filled with water, sink the vessel six feet. It is Diesel-powered and capable of a speed of ten m.p.h.

Takes Scrubber Off Her Knees

HERE is a handy handle, recently designed, that fits any type of scrubbing brush and takes the scrubber off her knees. The housewife needs but to clamp her brush and do this hard and tedious, though necessary, job standing up. There is only one "moving" part—the set screw — which locks the brush into the holder. It can be removed in a few moments.

There is nothing to "go wrong" or cause mechanical trouble.

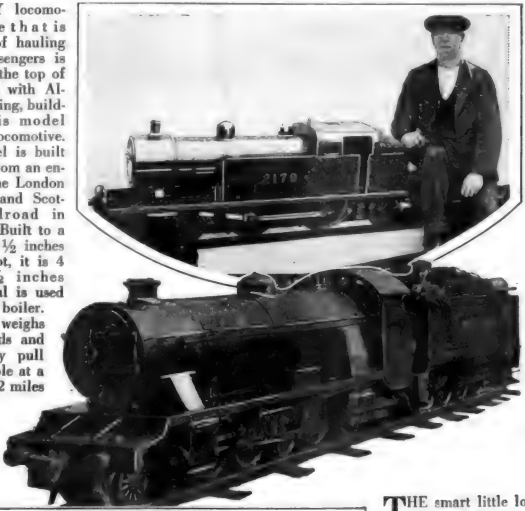
A SELF-PROPELLED barge, 246 feet long and with a cargo capacity of 2500 tons, that "ducks" all bridges on its route was recently put into service on the Chicago River. It operates on the "submarine" principle—filling ballast tanks to lower the craft. The boat, which was designed by L. D. Smith, of the Leathem-Smith-Putnam Navigation Company, Chicago, is powered by Diesel engines.

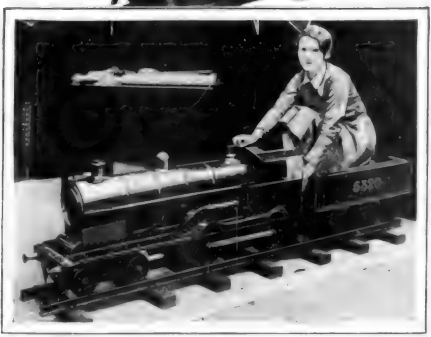
Scots Seek Beauty in Concrete

THAT concrete structures should look like natural stone instead of some artificial monstrosity, is the contention of the Royal Fine Art Commission of Scotland. In designing the Aitcham Bridge in Shropshire, it was found possible to use fragments of a type of stone so that the bridge resembles a structure built of that material. It has added much to its beauty.

Baby Locomotives Haul Passengers and Loads of Freight

A BABY locomotive that is capable of hauling eight passengers is shown at the top of this page with Alfred Golding, builder of this model steam locomotive. The model is built to scale from an engine of the London Midland and Scottish Railroad in England. Built to a scale of 1½ inches to the foot, it is 4 feet 10½ inches long. Coal is used to fire the boiler. The model weighs 224 pounds and will easily pull eight people at a speed of 12 miles an hour.

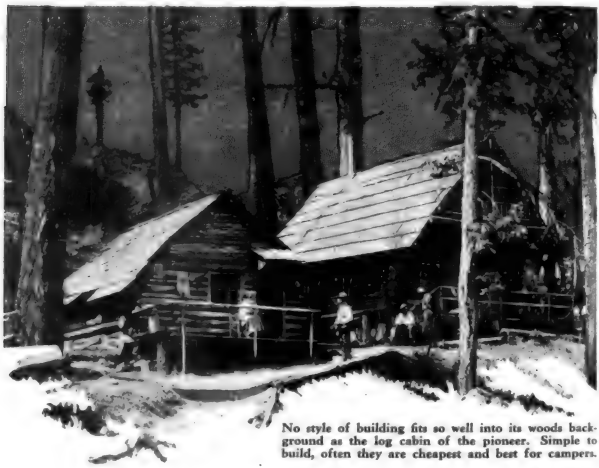




One of the model locomotive features at a show in London, England. It can easily pull a load of eight people at a speed of twelve m.p.h.

THE smart little locomotive shown above has two chief features of interest; its size and the fact that it has an extra power cylinder which has been fitted to the tender, giving the locomotive a real "sting" in its tail. Total length of engine and tender is 25 feet and the weight of engine and tender in working order is just under seven tons. This baby locomotive does real work as part of the equipment of the Ravenglass and Eskdale railway operating 20 miles of narrow-gauge line in the county of Cumberland, England.

Pointers on Building



No style of building fits so well into its woods background as the log cabin of the pioneer. Simple to build, often they are cheapest and best for campers.

by **EARLE GAGE and JOHN H. DENISTON**

THE log cabin camp on the shore of some pine-rimmed lake or river, in the heart of the forest wilderness, makes an irresistible "Call of the Wild," which has a subtle magic all its own, and seldom lets go once it has cast its lure upon us.

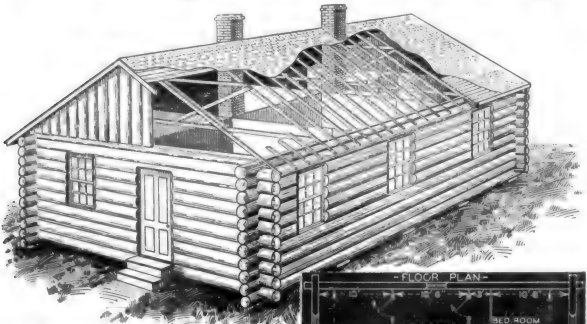
With summer skies beckoning to minds tinged with the restlessness known as the fever to "rough it," and any sort of a shack need not be found at the end of the trail. It is easy, by following a few simple rules, to construct a log cabin at very small cost, providing protection from all kinds of weather, and thus insure a year-round place for outings.

Be sure to erect the cabin at a level to insure good drainage, the land sloping to the north or west, away from stagnant water. At the rear, or south end of the lot, a slight dip in the profile of the land is best. Get at least half a mile away from any *mosquito breeding* water.

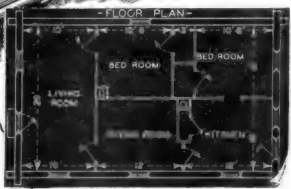
Where the cabin is erected on the highest spot of land it is nearly certain to be warm and dry, since the colder air falls to the lower levels and rain water drains away from the cabin. Waste water may be carried away to the rear of the cabin, to percolate into a stone-bed and thus avoid contamination of the stream or drinking water supply.

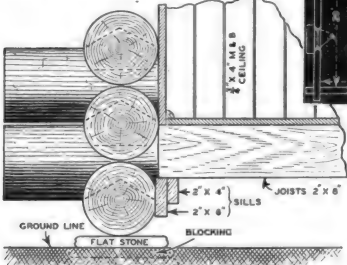
Logs for the walls should not be less than six or eight inches in diameter; three to five-inch poles may be used for the roof rafters. To insure the durability of the logs, they may be seasoned and treated with creosote, although most people prefer green logs with the bark left on. Although cedar logs are best, most any native wood will answer the purpose, and will last for sev-

Log Cabin Camps



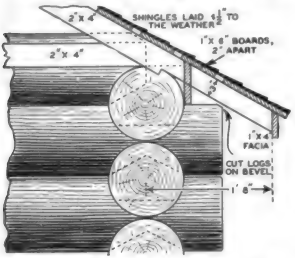
Above: Modern cabin construction: Below, details.





Mr. Gage's conception of the simplest adequate summer log cabin camp is shown above in floor plan, while the perspective shows how the roof and gable is framed. The log-keying is shown in the upper detail. In the blueprint to the left is a simple way of making a "synthetic" cabin which makes the logs go twice as far and which is Mr. John H. Deniston's economic building idea.

How Rafters Are Anchored to Sills



This shows how the roof is anchored to the sills, which in this case happen to be the top logs. Two by four rafters and ties should be used.

eral years if cut and handled properly.

"Is there any disadvantage in building a log cabin with logs which have not had the bark removed?" is a common question. Some people think that a cabin looks more "wild and wooly" if the bark remains on the logs, and would leave it on if there were no disadvantage.

However, peeled logs are usually used for building camps because the unpeeled logs hold the damp, which causes them to decay very quickly, besides affording a hiding place under the bark for wood-borers, ants, and slugs, beside a place for mosquitoes to camp.

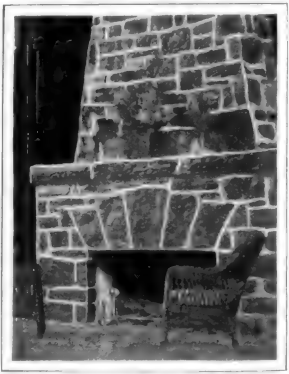
The foundation upon which the cabin rests is very important, for the old saying about "building on shifting sands" has a double meaning to the erection of the cabin, made as it is, of material much heavier than the average home. When we remember that a log which is 10 inches at the butt, running 40 feet in length and tapering to 4 inches at the top, weighs about 700 pounds, and that the average six-room-and-bath log cabin demands not less than 190 to 200 logs, making a total weight of about 60 tons for logs alone, we can appreciate something of the great need of a real foundation to support the load. Where frosts penetrate to a depth of two or three feet, it is necessary to excavate and put the foundation down below the frost-line.

Concrete abutments make the best foundations; those which support outside walls and partitions should be spotted not more than 6 feet apart. Each should be not less than 24 inches square at the bottom, tapering up to 10 or 12 inches at the top. The abutments should extend to a depth of at least a foot below the frost-line.

The accompanying illustration shows how to fit the ends of the logs together at the corners of the cabin.

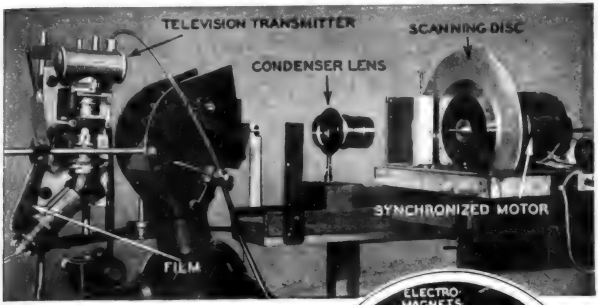
On page 103 in the lower left hand corner you will see illustrated a suggestion which has been used in many cases in Wisconsin where the supply of logs was not too heavy and the quickness of the method recommended itself.

The logs are selected out of Norway pine or Jackpine or any tree which has a straight trunk and little taper. The logs are halved evenly on a saw rig. They are also edged. Then they are laid side by side, and nailed at the ends to two-inch planks. Thus you make a wall on the ground, and erect it whole. Before the wall is complete, other log halves are placed so as to cover the seams of the log below, and in between is placed a good two or three layers of tar paper. The log halves are nailed both to each other and to the planks. When the walls are erected the edges of the planks are spiked together heavily and the ends are like a pig trough on end until they are boxed with vertical log slabs as illustrated.



Here is the flagstone fireplace used in the cottage on page 102. It is simple to build and will quickly heat the log cabin backwoods retreat.

BAIRD At Last Synchronizes Television

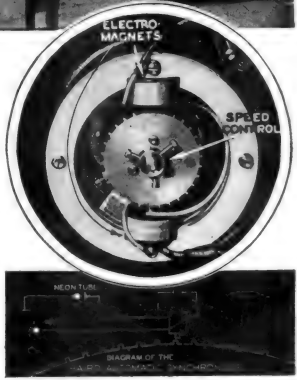


Synchronization of speech and image is accomplished by Baird in the utilization of two transmitting stations, one each for speech and image.

SYNCHRONISM which uses separate channels of communication, and is sufficiently simple and inexpensive to come within the scope of the domestic user, has been accomplished by John L. Baird. Recent demonstrations emphasize the possibilities of broad use in the near future. During these demonstrations no separate synchronizing signal was sent out, the picture being transmitted through one station and the speech through another on separate wavelengths, the picture itself providing the synchronizing impulses necessary to keep the receiver in step with the transmitter.

Synchronizing is accomplished by taking from the picture part of the current and using this to keep the mechanism in step. Where a large receiving disc is used a commutator directs current through a relay circuit for a brief interval during each line of the picture.

Between one image and another there is a black division. This is not artificially produced, but is the natural demarcation between one picture and another. When the machines are synchronized the commutator connects the relay at the space and no current flows through. If the receiver goes slightly faster than the transmitter, the commutator, at a lighted portion of the image, passes current through the relay, giving an accelerating impulse. The receiver is arranged to run slower than the transmitter so that balance is achieved.



Electro-magnets replace the more complex commutator and relay arrangements in the smaller synchronizing units. Teeth in a steel wheel correspond to the interruptions created by the commutator. It is not, however, a phonic wheel.

The synchronizing mechanism is simplified in the smaller commercial machines. In place of a commutator and relay the correcting signal is applied directly to an electro magnet which acts upon an iron wheel having teeth corresponding to the interruptions in the commutator.

Edited by MAJOR H. H. ARNOLD

Predicting the Performance of Tomorrow's Airplanes

FIFTEEN years ago the airplane had practically no background on which to base predictions of future performance, but today the science of engine and airplane building has advanced to such a degree that calculations of the future can be made with a very fair degree of accuracy. One notable fact is that the airplane which sets new records is usually of orthodox design; radically "different" planes can seldom hold their own in comparison with the product of 26 years of development.

Changes in design and construction have, of course, been gradual. Aeronautical engineers have learned that an increase in power does not necessarily mean an increase in speed unless a plane is especially designed to take advantage of it. In 1916 an American two-seater with a 200 h.p. engine developed a speed of 96 m.p.h. During the war the Liberty engine of 400 h.p. was produced. The Liberty was installed in the two-seater with the expectation that its top speed, climbing ability and carrying capacity would be greatly increased. Actually the top speed proved to be 107 m.p.h., an increase of only 11 m.p.h. with doubled horsepower! All of which goes to show that when an airplane has been refined over a period of years, no startling improvement in performance is to be expected, no matter how much power is added.

Improved wing curves, lower weight-power ratio, and more efficient streamlining cutting down parasite resistance are factors which have increased the performance ability of modern airplanes.

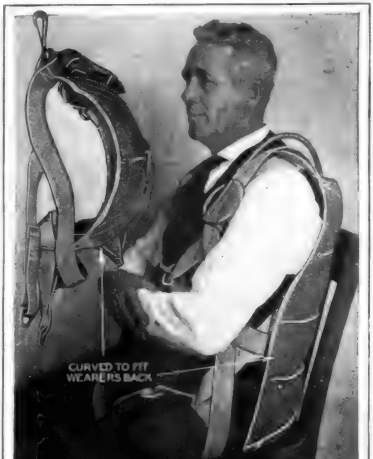
Judging by the curve of airplane performance, going back to the Wright brothers and dating up to the present day, it is safe to predict that the first speed record of 400 m.p.h. will be attained by 1933. The present record is 368 m.p.h., set by Orlebar, pilot of the recent Schneider contest winner. By 1938 an airplane will have reached an altitude of 42,500 feet, about 2,500 feet above the present record. During 1933 an airplane will fly a distance of 6000 miles without landing or being refueled. Paste these predictions in your hat and see if the present trend of airplane design and motor construction doesn't bring them true in advance of the dates given in this article!

Major H. H. Arnold

is a recognized authority in the field of the airplane, being the author of a number of widely accepted text-books on aeronautical subjects, as well as a practical flyer of long standing. He served as assistant chief of the American Air Service during the World war.

Comfort and Safety Combined in New Form-Fit Parachute

PARACHUTES, it is generally admitted, are rather uncomfortable to wear on long flights because of the bulky nature of the pack. Airmen have been perfectly willing to suffer minor discomforts for the safety of having a positive aerial life preserver, but recently a new type of parachute pack has been developed which not only affords the same safety features as the old, but fits the body of the wearer comfortably, as shown in the photo at the right.



Fitting the curvature of the back, this parachute is a comfortable cushion. The rip cord ring is at the left shoulder.

Movement on the part of the flyer wearing this new parachute is restricted little more than by a heavy flying suit. The old type is cumbersome and is worn in such a position that it makes locomotion difficult. The form-fit 'chute fits snugly against the wearer's back, forming a comfortable cushion, whereas the ordinary type is carried either as a rather bulky seat or in the lap of the wearer. An additional advantage of the new 'chute pack is that it has no projections to catch on the various controls, levers, valves and handles in the cockpit. All the essentials of a parachute are included in the form fit pack, the only difference being in the manner the fabric is folded within the envelope.

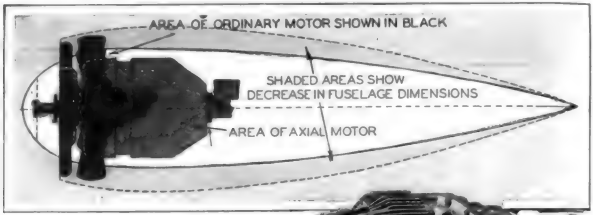
Training for Aero Engineering

ONLY a few years ago there was but one place in the United States where one could go and secure a degree as an aeronautical engineer. Engineers who graduated from courses in universities or technical schools and who wished to specialize in aviation had to go to the one aeronautical engineering institution, the Massachusetts Institute of Technology. Today, with the whole nation gone air-minded, there are schools scattered all over the country where such training can be secured.

Airplane factories sprang up almost overnight a few years ago, following Lindbergh's flight which aroused the public to a popular interest in flying. Every factory needs one or more engineers, some of them as many as four or five. Where were they to come from? A real aeronautical engineer is almost priceless and they are few and far between.

To answer this demand many of the most important universities instituted courses leading to a degree in aeronautical engineering. Over $800,000 from the Daniel Guggenheim fund for the promotion of aviation has been granted to colleges for special equipment, additional buildings and new professorships. A few of these colleges are Armour Institute of Technology, New York University, California Institute of Technology, Purdue University, Massachusetts Institute of Technology, Leland Stanford University, Rensselaer Polytechnic Institute, and the Universities of California, Detroit, Michigan, Minnesota, Nebraska, Wisconsin, and Wyoming.

New Air-Cooled Motor Cuts Down Frontal Area by Half

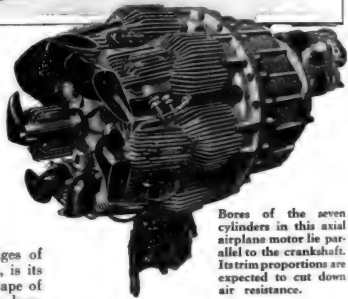


Streamlining of fuselages can be carried to a much finer degree, as shown in the above diagram, by the use of a new small-diameter air-cooled motor.

DURING the past three years air-cooled engines have gradually replaced the water-cooled power units in the English and American commercial air fleets because of the inability of the radiator and piping of the water-cooled engine to resist prolonged periods of vibration. One of the disadvantages of the radial air-cooled engine, however, is its large frontal area which spoils the shape of the nose of the fuselage and sets up a huge amount of power absorbing head resistance.

A new aeroplane motor has been evolved by the Redrup Lever Engine Syndicate, an English firm, which has a very small frontal area. Its compact arrangement may be gauged from the fact that the seven-cylinder 100 h.p. model is only 17⅛ inches in diameter, which is about half the diameter of the more conventional type of radial power unit. Since the frontal area of an engine is proportional to the square of its diameter this motor offers only a quarter the resistance to flight that the usual radial type does. The inventor claims that on a three-engined plane the reduction in power unit frontal area effects a saving of 30% of the power required for flight.

The bores of the seven cylinders lie parallel to the crankshaft and they are equally spaced round it, the cylinder heads being situated just behind the propeller boss. The crankshaft has one throw of Z formation and on this is mounted a star shaped wobble plate having seven arms.



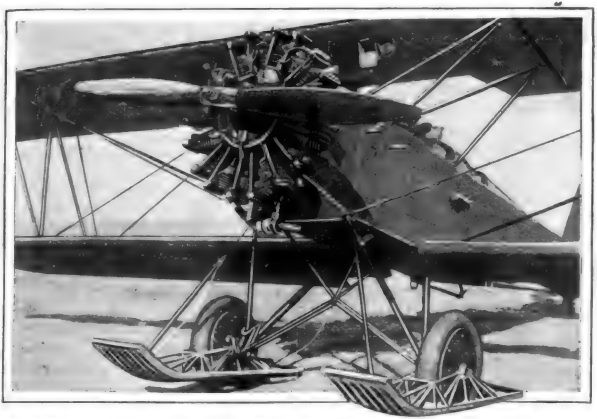
Bores of the seven cylinders in this axial airplane motor lie parallel to the crankshaft. Its trim proportions are expected to cut down air resistance.

Who Is the Safest Plane Pilot?

RECORDS kept by the Army Air Service show the frequency with which accidents may be expected to occur to pilots with varying numbers of hours in the air. Based upon total flying time, the accident-expectation chart runs as follows:

A pilot with less than 400 hours of flying may be expected to have one accident for every 500 hours in the air; between 400 and 800 hours, one for every 760 hours; between 800 and 1200 hours, one for every 890 hours; between 1200 and 1600 hours, one for every 1100 hours; between 1600 and 2000 hours, one for every 1000 hours; over 2000 hours, one for every 890 hours. Another factor bearing upon safety is the regularity with which the pilot flies. Altogether, the records seem to show that the safest pilot to fly with is the one who has a total of between 1200 and 1600 hours in the air and who flies more than 300 hours every year.

Wheel and Ski Make Snow and Ground Landings Possible



Skis of the type shown above can be attached to the landing gear of a plane without altering any parts. The wheel projects through a slot in the ski, enabling plane to land on snow or bare ground.

AIRPLANES are now used for so many different purposes that operations are carried on through all kinds of weather, and landings must be made not only on ordinary ground, but also on fields which may be covered with snow and ice. Skis have long been used on land planes in the winter time, being substituted for wheels on the landing gear, but with the increasing popularity of long distance flying it is not unusual for a pilot to take off from a snow-covered field and land on one entirely barren of ice.

In an emergency a plane fitted with skis can land on solid ground with reasonable safety. Numerous cases are on record where skilful bare ground landings have been made without damage to either ski or plane. There is, however, always a strong possibility of the skis being torn to pieces by irregularities in the ground, or of the plane itself being turned over on its nose from the drag of the skis.

To provide against such cases a combination ski and wheel gear has been brought out, as illustrated in the photo above. An examination of the picture will reveal the following points of interest: Skis can be installed without altering landing gear, fitting over the axles of the wheels. The skis do not interfere with a normal ground landing of the plane on its wheels and tail skid, but they carry the load of the plane when taking off or landing in snow.

Training Army Pilots

WHEN a student pilot in the Army Air Service has learned to take a plane off the ground, maneuver it and land it again, his training has just started. Before he is fully qualified he is taught to fly any kind of plane built, through all kinds of weather, for in the military service failure to execute a mission because of fog, snow, or rain is an alibi accepted with poor grace. The military pilot must be a jack-of-all-trades. He must be able to use the radio telegraph, to fly over triangular courses using only navigation instruments, to hold his own in aerial combat, to fly at night without getting lost, and to perform a score of other essential duties. No wonder Army pilots are among the best trained in the world!

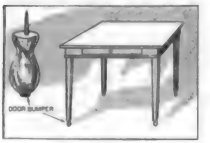
Short cuts in performing everyday tasks—novel methods of using waste products for useful purposes—suggestions for improving household efficiency —all such "handikinks" appear regularly in this department every month.

Sand Paper on Bottle Neck Identifies Poison Container

WHEN the home medicine chest contains bottles filled with acids or other liquid poisons, a strip of coarse sandpaper glued around the bottle neck as shown in the drawing at the left will give warning when one picks up the bottle with the fingers. The rough touch notifies the brain at once that a dangerous bottle is in the hand. This protection is especially valuable to photographers or others handling acid bottles in dark rooms. Its effectiveness can, of course, be increased if a wide strip of sand paper is fixed around the body of the bottle.—Ben Feyl.

Stocking Aids Pastry Cook

THERE is no need for piecrust or any kind of dough sticking to the bread board or rolling pin. Simply cut the foot from a child's white cotton stocking and draw the leg over the rolling pin, completely covering it. A heavy thread run around the edge of the stocking at both ends should be drawn down tight and fastened securely to hold the stocking in place. In working the dough, place a piece of canvas or an ordinary dish towel over the bread board, flour as usual, and you will find that your troubles with sticky dough have been eliminated.—Etta Neumann.

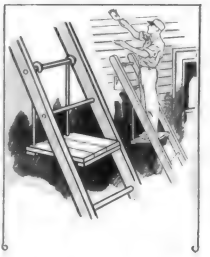


Door Stops Used to Increase Height of Table

IN THE event the housewife is a little taller than the average, she may find the ordinary kitchen table to be too low for comfort when she stands or works before it. Door bumpers of the familiar variety will raise the table about four inches when screwed to the bottom of each table leg. A firmer job will result if a coat of glue is placed on the shoulder of the stop.—Lester J. Young.

Household Aids Easy To Make

Platform Makes Standing on Ladder Easy



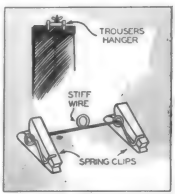
WHEN it becomes necessary to stand on a ladder for a long time, as when painting a house, a portable standing platform such as the one shown in the drawing at the right will prevent the feet from becoming tired. The construction of such a platform is very simple, consisting simply of three or four crosspieces nailed to two cleats, one of which fits over the rung of the ladder and prevents the platform from slipping off. Metal rods with a hook at the end are anchored in the other cleat and these support the platform as shown.—Ernest Mayhew.

Two-Chair Ladder

MANY times there is a need for a small ladder about the house, as for hanging pictures, fixing electric lights, etc., and at such times the ordinary stepladder is somewhat cumbersome. A serviceable ladder of the right height can be quickly and easily made by placing two chairs as shown in the drawing at the left, with a short board laid across the top. Such a step-ladder is steady and will not wobble.—Allan Lee.

Good Hanger Made From Spring Clips

MOST homes have a number of wooden spring clips lying around of the type which photographers use in hanging up negatives to dry. These can be made into excellent trousers hangers by mounting the clips at either end of a stiff wire looped at the center for hanging, as shown in the drawing at the right. When clipped to the cuff of the trousers this little device holds the clothing in an inverted position which helps to preserve the crease in the legs.—Helene Carlson.

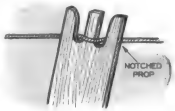


Cup Makes Good Emergency Top for Percolator

WHEN the glass top of a percolator breaks, as often happens, there is no need to discontinue using the pot until a new top can be purchased. If a china cup is placed over the opening at the top as shown in the drawing at the left, the percolator will function as well as ever. The cup serves in deflecting the boiling water down over the coffee, and permits it to come to a boil without running down the outside of the pot.—Irma Conway.

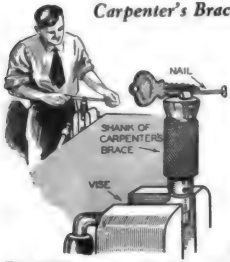
Notched Prop for Clothes Line Prevents Slipping

MOST trouble with the clothesline is caused by the prop slipping on the wire. If the upper end of the prop is notched as shown at the right, and the line laced as shown, it will be held securely without slipping. Line kinks can be worked out with pliers if position is changed.—F. O. Schubert.



Simple Devices for the Home

Carpenter's Brace and Nail Make Good Vise for Filing Keys



FILING and matching keys is not of itself an intricate job, but usually there is no vise handy suitable for holding the key unless you have special equipment. The jaws of an ordinary carpenter's brace will serve nicely, as shown in the drawing at the left. The shank of the brace chuck can be fastened securely in a large vise or clamped in some other fashion so that it is immovable. A small nail laid in the groove of the key will hold it tightly and prevent possible marring or bending of the blank as the jaws are tightened on it.—Frank Bentley, Jr.

No Slip Shoe Hobs

WHEN one is obliged to move around on a steep, slippery surface, as when shingling a roof with a steep pitch, a firm foothold can be assured by tacking several of the crimped caps which come on soft drink bottles to the bottom of the shoes. A half dozen caps on each shoe will be quite enough, four on the soles and a pair on the heels. Of course, it will not do to attach the caps to one's best pair of shoes.—Ben Feyl.

Bird House from Tire

AN EXCELLENT wren house can be made by sawing a section out of an old tire casing and mounting it on a wooden base as shown at the left. The open ends of the casing are filled with wooden blocks in which circular openings large enough to admit the birds have been cut. Cheap but weatherproof construction!—E. J. Smithson.

Split Base Prevents Line Prop From Slipping

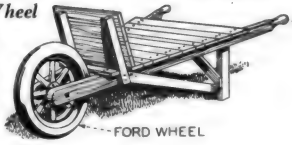
EVER have the clothes line prop slip and let the line full of freshly washed clothing down upon the ground? Such work-making accidents can be avoided by fixing the base of the clothes line prop as shown in the drawing at the right. The lower end is split up for a short distance of a foot or so and the two halves spread apart with a block to form a Y, the ends of which dig into the ground and hold the prop.—Ruth Weber.

Brace for Knee Aids in Using Top Step of Ladder

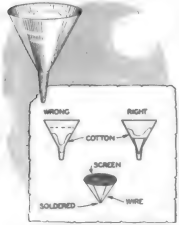
IT IS perfectly safe to use the top step of the household stepladder, providing you can maintain your balance. This is a rather difficult thing to do, however, unless there is something handy to brace yourself with. A detachable brace built after the design shown at the left will serve to steady the knees when one stands at the very top of the ladder. It is inserted through notches and fitted into a socket at the lower end as shown.—Claude H. Cook.

New Wrinkles for the Handy Man

Wheel Barrow Made From Ford Wheel



GOOD wheels from used Fords can be picked up cheaply at any garage. If you construct a wedge shaped frame of 2 by 4's, put up a front apron, and floor the whole with one-inch lumber, such a wheel can be used to make a very acceptable wheel barrow as shown at right.—R. McNamara.

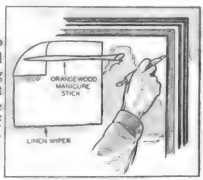


Screen Support Speeds up Filtering Process

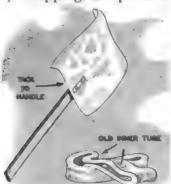
ORDINARY household practice in filtering liquids through a funnel calls for the use of cotton placed in the lower part of the funnel. This way, however, the moist cotton packs itself into the constricted exit of the funnel and prevents liquids from flowing through quickly. To prevent this, cut a piece of ordinary window screen in a circular shape to fit about two-thirds of the way down the funnel, as shown, supporting it with four wires soldered together at their tips. Cotton placed on top of this screen cannot pack itself in a mass, and permits liquids to pour through the funnel as rapidly as poured from the container.—D. W. Ciark.

Manicure Stick Aids in Painting Windows

THE average home painter finds it almost impossible to paint around windows and mirrors without getting small streaks of paint on the edge of the glass. In rejuvenating a vanity dresser with three mirrors the writer discovered that by wrapping the pointed end of an orangewood manicure stick with a single fold of linen and using it as a wiper whenever paint got onto the mirrors.—Etta Neumann.



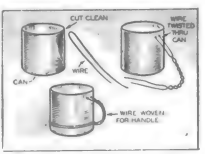
Piece From Inner Tube Makes Good Fly Swatter



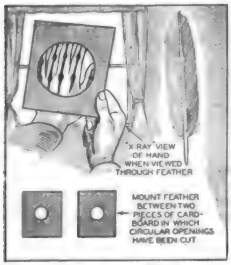
AN EFFECTIVE fly swatter can be made in a few minutes from an old inner tube. First split the tube and fold it so that it lies flat. A piece of the proper size for the swatter is then cut out and tacked to the piece of wood that is used for the handle. In tacking the rubber it is best to use a small piece of cardboard.—Ray Champion.

Tin Dipper Made With Twisted Wire Handle

A HANDY tin dipper useful at the farm pump and around the house can be made from a tin can cut off cleanly at the top. Two small holes are punched through the side of the can, close together, near the top, and a sufficient length of wire inserted, which is then twisted together as shown in the drawing at the right. When wrapped a couple of times around the bottom of the tin this makes a serviceable handle.—James Bates.



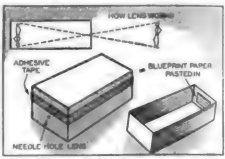
Simple Devices You Will Find Useful



Bones Can Be "Seen" With X-Ray-Scope

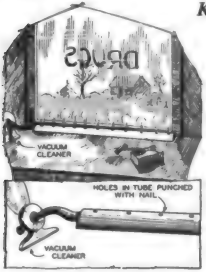
A REAL X-ray machine is a complicated mechanism, but the "X-ray-scope" shown at the left is easily made. The secret of its operation lies in a lowly feather. When you hold up your hand between your eyes and the window and look at your fingers through a feather, the effect will be as if you were viewing your hand through the X-ray. The bones will appear to stand out clearly while the flesh will seem a transparent pink. If you wish to make this effect more mysterious to your friends, cut circular openings in two pieces of cardboard and glue them together with the feather between them across the opening. Results will prove surprising enough for anybody.—W. L. Roper.

Taking Pictures With a Shoe-Box Camera



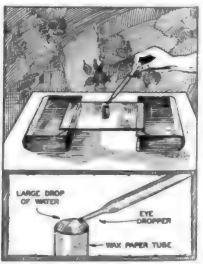
YOU can make an interesting little camera out of a shoe-box. Pierce a hole in one end with a needle for the lens. Inside the box, at the end opposite the pinhole, a piece of blueprint paper is mounted; this must be done in a dark room. Adhesive tape makes the box cover light-proof. A two-minute exposure will give a picture which can be developed by washing in water.—Robert E. Larkin.

Keeping Frost Off Windows Without Using Fan



IT IS common practice among shop owners to keep an electric fan running in a store window to prevent frost from accumulating on the glass during cold weather. This direct circulation of air, however, is sometimes disastrous to window displays of flimsy nature. A method that quickly removes frost is to place a piece of metal tubing on the floor next to the glass, puncturing a number of small holes with a nail along the length of the tube. One end is stopped with a cork and the other connected to the output of a vacuum cleaner or other available small air turbine.—Kenneth Bronaldo Murray.

A Water Microscope

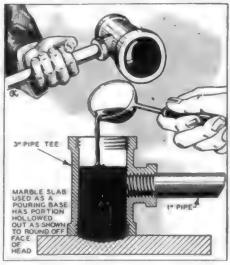


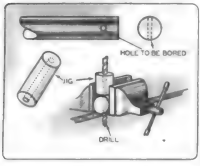
WITH a sheet of glass, a piece of waxed paper and a few drops of water, you can make a microscope which will magnify small objects with unexpected clearness. Take a strip of wax paper and roll it into a cylinder about three-eighths of an inch high and a quarter inch in diameter, glueing the edges together. Place the tube upright on a strip of glass supported by two books, as shown. Carefully fill the tube to the top with an eye-dropper so that the top of the liquid is convex, forming a water lens which does the magnifying.—Earl Buell.

Hints for the Home Workshop

Soft Face Metal Hammer Made From Pipe

FOR working sheet metal and for other uses around the shop where a hard-metal hammer would be unsuitable, a soft-nose mallet made from pipe as illustrated in the drawing at the right will prove useful. The head of the hammer is formed of a three-inch pipe tee, to which a long length of one-inch pipe is screwed as a handle. Lay the tee on a stone or marble slab, after the handle has been attached, and pour in molten lead as shown. To produce a rounded nose on the hammer, hollow out the slab a trifle beneath the tee. To prevent the molten lead from flowing into the handle, the end can easily be stopped up with lead before the handle is inserted.—Alvarez da Rousso.



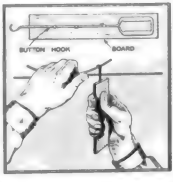


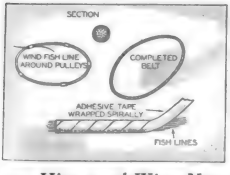
Kink for Boring Holes Through Round Shafts

IT IS a difficult task to bore a straight hole through a round shaft without some kind of assistance. A piece of shafting of the same diameter as that to be drilled can be bored through the center, slightly oversize, as shown at the left, to serve as a jig. When the jig and the shaft to be drilled are clamped in a vise, a straight hole can be bored.—Ephraim Cleets.

Mounted Button Hook Serves as Wire Splicer

AN ORDINARY button hook makes a handy wire splicing tool when mounted as shown in the drawing at the right. The mounting is a piece of hardwood board, the shoulder of which is used to turn the wire, producing a very neat job. Two or three tacks or staples are sufficient to secure the button hook to the board. If a more durable splicer is desired, the hook can be mounted on a strip of 16 gauge sheet iron, case hardened at the shoulders. The drawing gives a good idea of how the instrument is operated.—Delmar J. Hill.



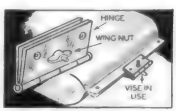


Fish Line Makes Belt Drive for Machine

WHEN the belt drive on small electric motors wears out and a substitute is not at hand, ordinary fish line can be pressed into service. Wind several strands of the line around the pulleys, not too tightly, and then take a roll of tape from the shop tool kit and wrap it spirally around the lines as shown in the drawing at the left. The resulting belt is quite serviceable.—Dave Bennett.

Hinge and Wing Nut Act as Small Vise

A SMALL clamp made of a hinge with a bolt and wing nut for tightening is a cheap and serviceable piece of equipment for workers such as tinsmiths who frequently need some such small device for holding pieces of metal together for soldering.—Smok E. Neumann.



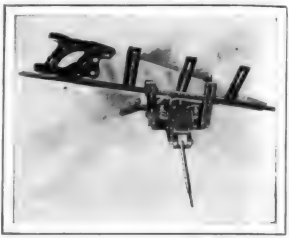
NOVELTIES *in Tools and Such*

THOSE shop men to whom riveting is a problem will be interested in a portable riveter recently introduced. It is capable of exerting approximately one ton on the dies although it weighs only 15 pounds. A handy button, convenient to pressure from the thumb, operates the mechanism. It is recommended for use in riveting automobile bodies, hoods and instrument panels.

Nut-Lock Has Interesting Features

THE new automatic nut-lock is, according to its inventor, a nut run on any bolt, any place, in the usual way which locks automatically wherever stopped and unlocks under slight wrench pressure. It runs off freely and cannot be released by hand. The lock can be used on any type of nut or bolt. The stem and blade of the locking key is well made and of high tension.

HERE is a machine that retooths all kinds of saws quickly, accurately and at low cost. The average man can retooth a 26-inch hand saw in 3 minutes, and it takes only 4 minutes to retooth a mitre-box saw.



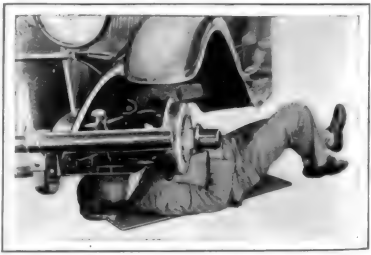
Reconditioning hand saws is made easy with this retoother. It punches new teeth over the old.

It cuts 20 sizes of teeth, from 4 to 26 points per inch, and every tooth is cut absolutely uniform. It is easily and quickly adjusted for any hook or size of teeth.

This retoother is a real time-saver and money-maker for the shop. By punching new teeth right over the old ones on saws whose teeth are in bad condition, you can save both time and labor on saw filing jobs. After the new teeth have been cut, it is only necessary to file them lightly.

Work-Mat Without Casters Saves Time and Patience Around Garage

GETTING under cars usually requires the use of jacks so that the "dolly" can slide in and out with ease. This somewhat complicated arrangement has been simplified by an automobile mat that does away with jacks when repairs are to be made. It permits repairmen to get under low clearance cars without raising the car. It slips easily along the floor and, as there are no casters, it does not roll when leverage is needed in tightening nuts and bolts. It cannot be damaged if the car accidentally is driven over it.



Getting under low-clearance cars is simple with this work-mat.

for SHOP *and* HOME

HERE is a little idea that's handy anywhere where smokers and papers gather. It is a combination ash-tray and paper weight that will not tip over. The unusual heavy base keeps it erect. Likewise it is sufficiently deep to keep ashes from blowing all over the desk in case of strong drafts from window or electric fan. It is of metal and finished in high-gloss black with trimming of brass.

THE Hemaco electric woodworking machine is a portable machine that employs a variety of tools. It is powered by a motor using AC or DC current. It may be used for cleaning, scraping, sanding, rasping all wooden surfaces, either hard or soft wood, and will perform the work of several men in a fraction of time.

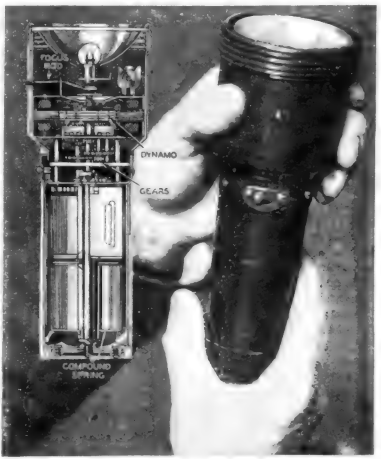
A few of the many tools that can be used with this machine include sanding drum, sand paper and emery cloth belts, steel wire brushes, cylinder rasp, boring chuck, circular saws, buffing and grinding wheels.

Battery-Less Flashlight Generates Own Current With Spring Motor

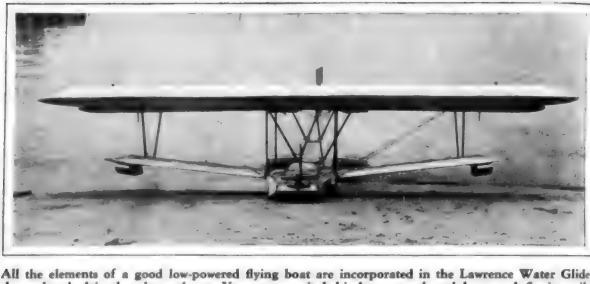
AN ELECTRIC flashlight that generates its own "juice" is one of the latest additions to the field of things new and novel. It is entirely battery-less and requires no oiling or adjustment to keep the light going. Magnets generate the electricity for the No-Battery Flashlight merely by the turn of a spring in the handle. It provides several minutes of continuous light before it becomes necessary to rewind the spring. Pressing a button sets the motor in operation. This produces sufficient current for a 2½-volt light.

The No-Battery Flashlight is not affected by exposure and dampness. There is nothing whatsoever to get out of order. It is built like a watch and will last, according to the manufacturers, as long as a watch.

Because of the battery-less feature, the sturdy construction and self-generating principles, this flashlight is indispensable to sportsmen, campers, boatmen, travelers and about the home or shop.



Generating its own current through magnets operated by a spring, the No-Battery Flashlight answers a long-felt need for a light that needs no "spares" for continuous operation.



All the elements of a good low-powered flying boat are incorporated in the Lawrence Water Glider shown beached in the photo above. You can tow it behind your outboard boat and fly it easily.

NOTES *on the* DESIGN *of the* *Lawrence Water Glider*

Mr. L. W. Lawrence has built a glider which he tows behind a motor boat and which has enough area to be converted into a low-powered flying boat with the addition of a small air-cooled motorwheel engine. Here he gives his notes on constructing it.

YOU fellows who are following the design series running in MODERN MECHANICS are here dished up a distinctly novel, though thoroughly practical, tried and tested design which embodies extreme simplicity of construction. All the parts are small, facilitating basement or small shop construction, and the Editors are willing to bet one good wet nickel cigar that there are many men who do not have the best kind of terrain at hand for conventional flying, who can hook this little ship on behind an outboard boat and sail for as long as the engine will run and as "long as the lake lasts."

We have, by way of whispering in your ear a treasured state secret, a project on the fire for powering one of these gliders with a small converted air cooled motorwheel engine.

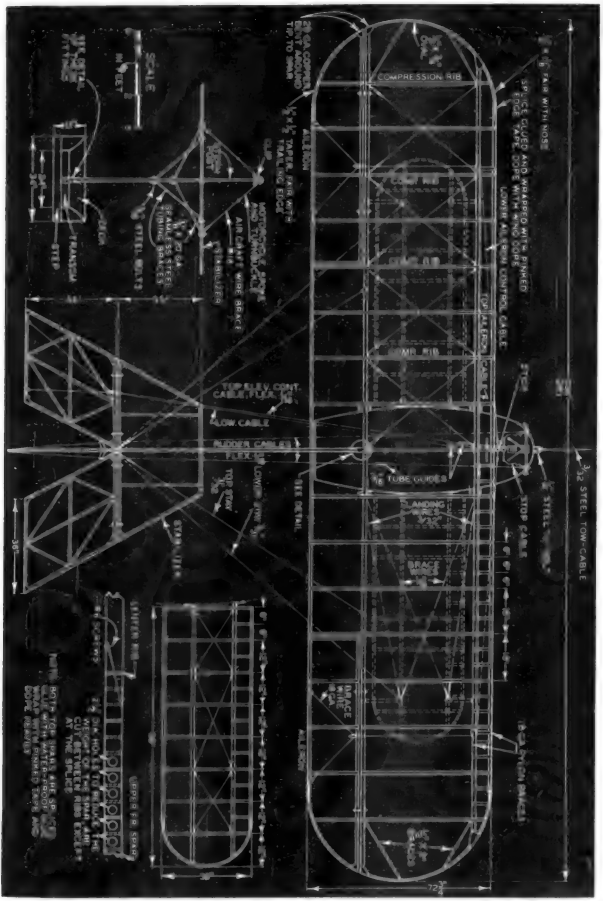
That's for later—the write-up of the engine. If it works, and engineering data seems to indicate there is enough soup in the motor to yank this little wagon off the water, then we'll have a left-handed version of "the Flying Bath Tub," mentioned some time ago, but abandoned because of the impracticability of the project as regarded the costs which the amateur would have to meet.

But here is an honest to goodness water glider—the first time plans for one have ever been published in America! And instead of the usual cut and dried how-to-build article we give here designer's account of the ins and outs of her construction. Here is Mr. Lawrence's series of notes:

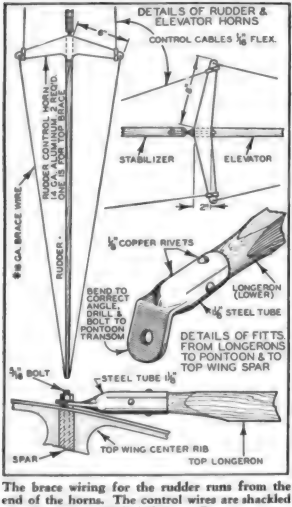
We will start the construction of the Lawrence Glider by making the pontoon first. The sides, bottom and deck are of the same thickness, 5/16 clear spruce or plywood.

The sides are one piece, one foot wide by seven feet, five inches, allowing one inch for bending. Cut the sides to shape by laying the two sides together and putting a brad at each end to hold them together.

Here's Scale Plan of Water Glider Giving Major Working Dimensions



How the Tail Boom Is Anchored



The brace wiring for the rudder runs from the end of the horns. The control wires are shackled over the horns with link fittings. Boom spars are ferruled and anchored to the spars as shown.

Now starting at the bottom scribe a 25½" radius from the top of the side to where it runs out on the bottom.

Now the stern is done the same way except that there is a three-foot and five and one-half inch radius on top of the side, leaving six inches square cut on the stern. Now measure forward three feet and nine inches along the bottom and square up three inches and take out this three-inch strip back to the stern; that gives you the step which comes a little aft of the C. G.

There is a five-eighths thick bulkhead that comes here at the step, forming the step.

Put two six-inch holes to make the bulkhead lighter; put two three-eighths by one and one-half stiffeners three inches from the inside edge of each hole, one on each side of bulkhead. The five-eighths by five-eighths oak or ash chine log is fastened to the side before bending the sides, either with three-quarters No. 4 brass screws four inches apart or drill and use small copper nails and rivet them. The stiffeners can be fastened to the side before bending the sides too, with No. 4 three-quarter brass screws.

We will take the solid nose piece as shown in the details and fasten the two sides to it with four seven-eighths No. 6 brass screws on each side. Having made the bulkhead as shown in the drawing, we will fasten that in place at the step using No. 5 one-inch brass screws one and one-half inches apart or approximately so, so be sure to keep the screws in the center of the piece they go into.

The three inch by seven-eighths transom comes next, that is the stern piece, using one-inch No. 5 brass screws for fastening the sides to the transom, four to each side. Now get a center line, one on the nose and one on the bulkhead, and one on the transom and take a straight edge three-eighths by four inches or thereabouts and bend from bow to stern.

Pull the bulkhead either way to true it up. After truing it up start the deck beams as shown in the detail.

They are one-half by two inches and are notched to go around the corner log, but the stiffeners are notched to receive the deck beams and the beams are fastened through the side with No. 5 screws, two at each end.

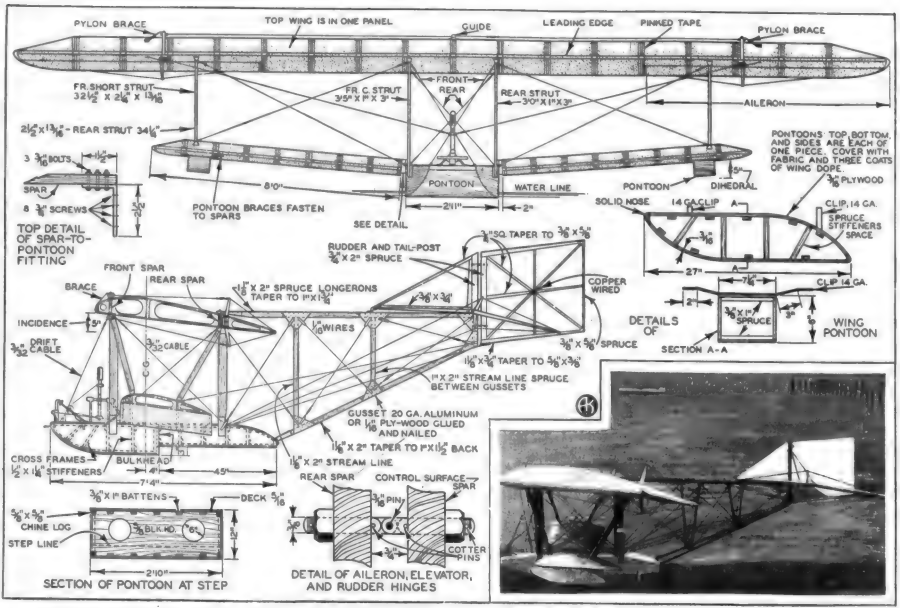
The deck beams are notched to receive the little battens that run fore and aft; these battens are three-eighths by one inch.

The seams of the decking are centered on these battens, or if you wish to eliminate the battens and use five-thirty-second thick decking and lay it on a forty-five with fabric between, this makes a very nice and strong job, but takes a little longer to do it. The bottom is done just as the deck is.

Put one by five-eighths inch struts between deck beams and bottom frames, put two to each frame, notch out strut ends to fit around frames and fasten with brass screws one at each end.

Do not put the deck on until you have the tow cable U bolt in place and the main strut blocks screwed to the side and the flying and brace wire terminal bolts and the stud bolt that receives the longeron fitting in the center of the transom. Fasten the bottom and deck to the framing with one-inch No. 4 brass screws. After you get the pontoon all finished cover the bottom with three thicknesses of a good grade of un-

Light in Weight, But Strong as Sandow Is This Neat Water Glider



The water glider presents no problem in handling that is not present with her dry land sisters, and in fact when afloat is much more maneuverable and easy to handle. The method of beaching is shown here. The bow of the pontoon is hauled square to the shore, then the wing turned end to wind.

bleached muslin and the sides and deck, two thicknesses, and give the bottom four or five coats of nitrate wing dope, deck and sides three coats.

Having built the pontoon we will start the main wing. It would be good to have a smooth floor on which to lay out the wing profile full size, that is one-half of the wing from the center rib allowing enough on the length of the spars to make the splice, which is two feet long with three-quarter-inch square end to the scarf. The splice is glued with water-proof glue (casein glue) and one No. 6 two-inch brass screw at each end of splice. Wrap the splice with pinked edge tape drawing it tight.

Give this wrapping a heavy coat of nitrate dope and wrap again before the dope dries, giving the second wrapping a coat also. Now come back over it again with another layer and coat again with two coats of dope.

Having made the spars we will lay out a template for the ribs. Take a piece of building board or a piece of white pine one-quarter of an inch by nine inches by six feet three inches. Be sure the bottom is straight and using this edge as a datum line and starting at the left hand end measure off six feet and seven-eighths inches.

Starting from the line at the left end, using a steel square, mark the datum line off into ordinates. Make these lines long enough to catch the camber measurements.

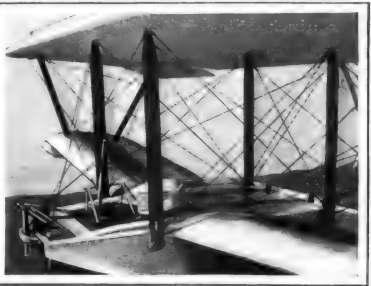
Starting from the nose and working towards the trailing edge, taking the measurements from the detail of the rib, the camber measurements are taken from the chord line, and the curves on the bottom of the wing are taken from the chord line to the bottom of the rib. Get the ordinate prick points established, take a small strip, three-sixteenths square and straight grain and tack this strip around these prick points.

If some of the spots are a fraction high or low, fair the strip so as to make the contour even and smooth both top and bottom, having a nice true curve.

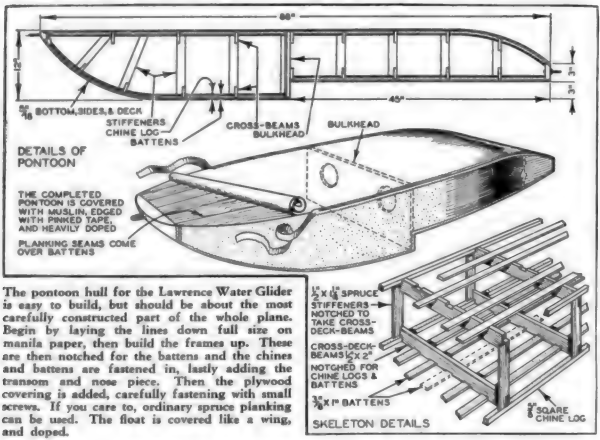
Having done this, saw out the lightening holes as shown in the detail, and saw out the section marked "spars."

Then take the seven-eighths by nine inch rib stock and mark out one on each board and saw out lightening holes. It takes seventeen ribs, but it would be wise to get out a couple extra. After sawing out the ribs in the board form, rip three ribs out of each seven-eighths piece and smooth them with a little planing or sand paper.

The trailing end of the rib can be made out of the piece that comes out of the lightening holes, and the nose pieces can be made out of the same piece by using care. Having made the ribs, now make the



The Glider's Hull Is Easy to Build; Plywood - Batten Construction



The pontoon hull for the Lawrence Water Glider is easy to build, but should be about the most carefully constructed part of the whole plane. Begin by laying the lines down full size on manila paper, then build the frames up. These are then notched for the battens and the chines and battens are fastened in, lastly adding the transom and nose piece. Then the plywood covering is added, carefully fastening with small screws. If you care to, ordinary spruce planking can be used. The float is covered like a wing, and doped.

nose and trailing edge as shown in the detail.

Next lay the spars out for the ribs starting at the center and going towards the tips one foot and six inches to center of the ribs. Starting with the center rib every three feet is a compression rib. The drag wire clips are bolted to the spars at these ribs. The clips are No. 16 gauge steel one inch wide by three and one-half inches long with two three-sixteenths-inch holes, seven-eighths of an inch from the center of the clips, and a one-eighth-inch hole in the end to receive drag wire.

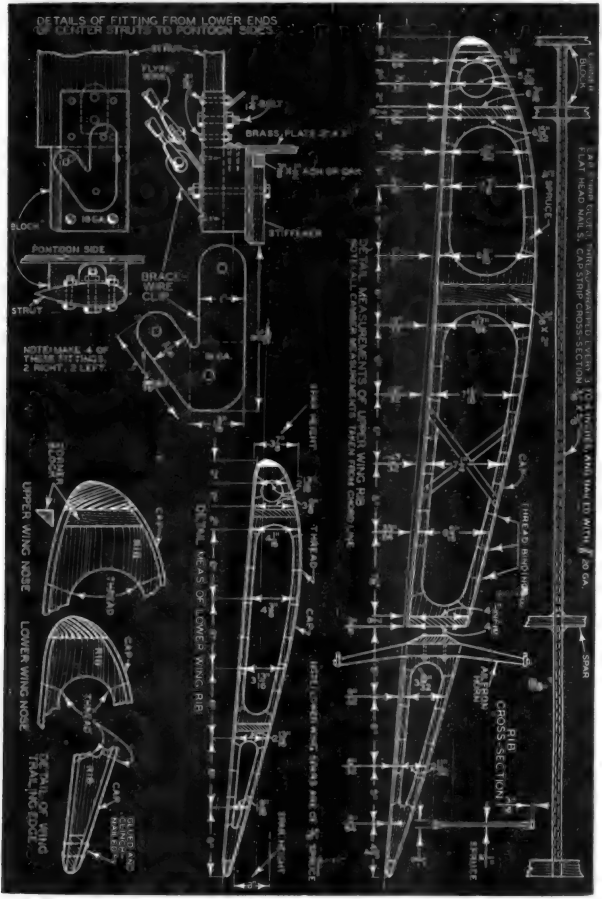
Use a plate washer on opposite side of clips, bolt clips to spar and rivet lightly to keep nuts from coming off. Put one one-half-inch seamless steel tube compression strut at each compression rib. Braze a one by one and one-half No. 16 gauge flange to end of compression struts so as to screw them to the spars.

Lay the spars down on a smooth flat floor or bench large enough to take care of the spars and length of rib between spars. Do not nail ribs in place until you line the wing up temporarily. If care is taken in cutting the rib ends they will line up very good. After lining up and squaring up the ribs nail some small blocks against the spars to keep them in place both ways. Be sure the spars are straight. Also be sure they are of a good, straight grained spruce and the two and one-half inch lightning holes are cut between each entering edge rib except between the two inside struts, leave that solid. The ribs are fastened to the spars with one five-eighths three cornered cheek piece or corner block on each side of rib using glue and three one-inch flat head nails No. 1 PD.

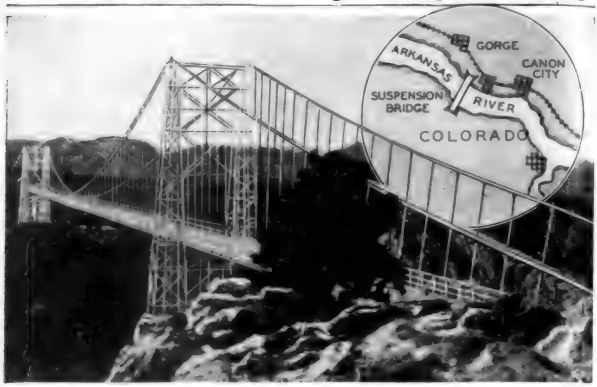
The ribs being in place we are ready for the drag wire bracing which is No. 12 air craft wire, using a one-half-inch copper tube sleeve on one clip and a split end turnbuckle No. 324. Be sure and safety wire these turnbuckles after truing up. After getting the entering edge and trailing end of the rib in place the nose and trailing edge are ready. The entering edge is fastened to the ribs the same as the spars. The trailing edge is held in place by the top and bottom cap strip which is continuous from the entering edge to the trailing edge

(Continued on page 194)

Here's the Print-dope on Wing Sections and Side Struts for the Glider



Colorado Now Has World's Highest Suspension Bridge



This monumental tower of steel spans the Royal Gorge of the Arkansas River, 1200 ft. above water.

THE new suspension bridge spanning the Royal Gorge of the Arkansas River, near Canon City, Colorado, is the highest in the world. The task of construction provided many engineering difficulties, the nearby ground being heavily wooded and rocky.

Condensers Cooled Like Motors

AIR-COOLING and oil-cooling systems are extensively used in the construction of condensers for high-voltage duty, according to G. E. Palmer.

Australian Photographer Catches Remarkable Picture of Plane Crash

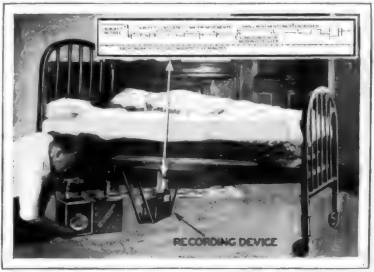
Note position of ailerons as pilot fought to regain control.

THE kind of a break every newspaper man keeps hoping for—to get the news before it happens—was responsible for this unusual picture. It was taken at the Mascot Aerodrome, Sydney, Australia, but an instant before the ship was a tangled mass of twisted canvas, wood and metal. Already the rear side wing tip was brushing the ground.

Not alone, however, is this photograph an example of quick-witted action on the part of a gentleman from the press for the position of the ailerons shows the pilot's cool-headed efforts to regain control of his ship. Fortunately, the pilot was uninjured in this mishap.

You Can't Lie Still and "Sleep Like a Log" in Bed at Night

IF YOU are reasonably healthy you are certain to twist and turn about when you are asleep. You just can't help it. In fact, scientists say all of your body can't rest at the same time and you must turn in order to rest. Investigators have made an exhaustive study of sleep at the Mellon Institute for Industrial Research. Ingenious contrivances for measuring sleep movements have been devised. An electric phonograph-motor drives a moving strip of paper on which the record was made of an individual asleep in the bed. The paper showed major and minor disturbances of position of more than 100 subjects over a period of months. It was found that intellectual workers are more restless than the skilled manual worker. The middle aged man is more restless than his wife.



Electric device under bed records movements of sleeper. It marks chart as shown in inset and records restlessness.

Now Reporters Fly High

REPORTERS worked in a fully equipped editorial room aboard an airplane which was one of 60 ships included in a tour of California as a part of the Western Aircraft exposition at Los Angeles. There was direct telephone connection between newspaper offices and their reporters in the ship.

Photo shows workers in flying editorial office.

Pelican Can Carry Smokes

HAVE a cigarette? With the present interest everywhere in storing cigarettes and matches in odd ways so as to amaze and delight friends and visitors, it was only a question of time until some ingenious person made use of the pelican's well known and justly famous jaw. Here's the way this has been done. If you want a cigarette and a match, simply press back on the bird's head and there you are! There's a hinge in back of its neck.

Bee Stings to Cure Rheumatism

ARTIFICIAL bee stings for the cure of rheumatism are the newest products of the medical laboratories of Vienna, Austria. The stinging chemical has been perfected by professors of the Polyclinic hospital. Physicians have long known that bee stings sometimes improve cases of rheumatism. The hospital professors made chemical analyses of bee venom and report having succeeded in duplicating and improving on it.

"Flying Eyes" Brand

Old time pilots know when young "ground flyers" lie about flying time. Veterans of many hundreds of hours in the air almost invariably have the "flying eye" with overlapping lid and wrinkles.

by **CAPTAIN C. W. PURCELL**

"AW SHUT up, yuh big bologna. I got enough flying time chalked up to know what I'm talking about." The rookie pilot who made this statement wondered why the old timer, a man with more than 6,000 hours in the air, looked at him with a slow smile that seemed to say "liar." The rookie knew he was lying. He did not have the flying time he claimed but cripes! A man has to add some hours to his time when he "ground flies."

See Dieudonne Costes' flying eyes. He has thousands of hours to his credit; flew around the world; recently made longest non-stop flight on record.

What bothered the rookies was the matter of how the old time "Pee-lot" knew he was lying. This wasn't the first old timer he had met, and every time he had tried to put himself up in the 3,000-hour class, all the old timers gave him the same smile. He didn't know them well; neither did they know him; still they seemed almost to know his flying time. He would like to know *how they knew.*

Well, here is the deep, dark secret: Flying Eyes. When a rookie leaves his 100-hour class and graduates into the 1,000-hour class he brings with him a flying eye. This flying eye can not be bought with money, and you can't "ground fly" into it. The only pay that nature accepts for this decoration is time in the air, otherwise known as flying time.

A flying eye, once noticed, can never be forgotten. But until it is noticed it can very easily be overlooked. When next you meet an old time "Pee-lot," notice his eyes. Look at the outside edges. You will see that his eyes come down to a slit, in some cases the top lid overhanging the lower one. For approximately every 300 to 500 hours spent in the air nature has endowed the pilot with one or two wrinkles, sometimes three or four. There is no set scale as to how many hours make a wrinkle, but there will always be plenty at the "trailing edge" of an old time pilot's eye.

One old timer tried to get rid of these wrinkles. Knowing that flying was becom-

Thousands of hours have given Lieut. James E. Dyer his flying eyes. Note how the upper lid overlaps and makes slits of his eyes. Perceive the wrinkles by his eyes. He flew 1,250 hours in one year without a single accident, winning the Schieff trophy.

the VETERAN PILOT

ing a "young man's game," he was afraid of going into the discard. So he went to a well known army doctor. After the doctor had explained flying eyes to him, he decided to keep his "merit medal." Most old timers would have known this, but he was an exception.

Now that the secret is out, the youngsters will be trying to find some way of making those wrinkles. But it can't be done. They will at least try to stand far enough away so that the wrinkles can not be seen, or they might draw them in with a pencil, when they "ground fly."

The first successful westward trans-Atlantic flight in the Bremen helped to give Captain Hermann Koehl this noticeable set of slitted "flying eyes."

In the illustrations herewith it will be easy to note the flying eyes of veteran pilots. Mail and express pilots who have piled up huge totals of hours spent in the air almost invariably have pronounced cases of flying eyes.

Now that we understand why the old timers have been able to single out the beginners, we have laid at rest one question in the minds of the young pilots but—what will our young ladies do? They are going to fly, and fly plenty, from the way they have started out. But what are they going to do about the flying eye with its necessary wrinkles?

If they own up to their 1,000 hours they will have flying eyes, and flying eyes mean plenty of wrinkles, and wrinkles are abhored by most of our young ladies of the air. However, this situation will have to be faced sooner or later by every woman pilot in the country today. But as the ladies have been showing the world that they can take care of their individual problems it will be interesting to note which will win out: cold creams and beauty doctors or the flying eyes.

Charles Lindbergh has an excellent example of flying eyes. See the overlapping lids. His sensational Atlantic flight and continued steady flying have branded him with veteran pilots' eyes.

If you think there's nothing in this "flying eye" business, test it out on the next pilot you meet!

New Type Sunshine Health Lamp Introduced by Graybar

Several new features are incorporated in the design of these lamps. They are double carbon-arc type and fit any outlet.

A RECENT addition to the ranks of "sunshine" health lamps is that of the Graybar Electric Company, Inc., New York. Unusual in design and portability it provides an abundance of sunlight from the electric light socket in every home.

This lamp is a double carbon-arc type designed to approximate sunshine and to be used in the average home. When equipped with a standard Sunshine Carbon or Super-Tan carbon, it is not a therapeutic lamp. However, therapeutic carbons can be obtained for use in this lamp, but only on physician's prescription.

Its construction is simple—four carbons are inserted in brass holders. Two at the top and two at the bottom. These double carbons operate in series with a resistance load. Electrical connections with these carbons are made at the back of the lamp. When the lamp is connected to the house circuit and the control lever touched, an arc is formed between the carbons.

Chamberlain's New Folding Plane

CLARENCE CHAMBERLAIN is apparently not content to rest on his laurels gained by spanning the Atlantic. Here is shown a front view of an airplane designed and invented by this noted pilot. When the wings are folded, the ship can be placed into an ordinary sized garage.

Colonel Chamberlain's new ship has a flying speed of 135 miles an hour and a ground speed of 35 miles an hour. It is powered with a Warren Scarab motor, 110 horsepower. Note air cushion tires placed on an angle for greater cushioning effect.

This ship can be housed in an ordinary garage.

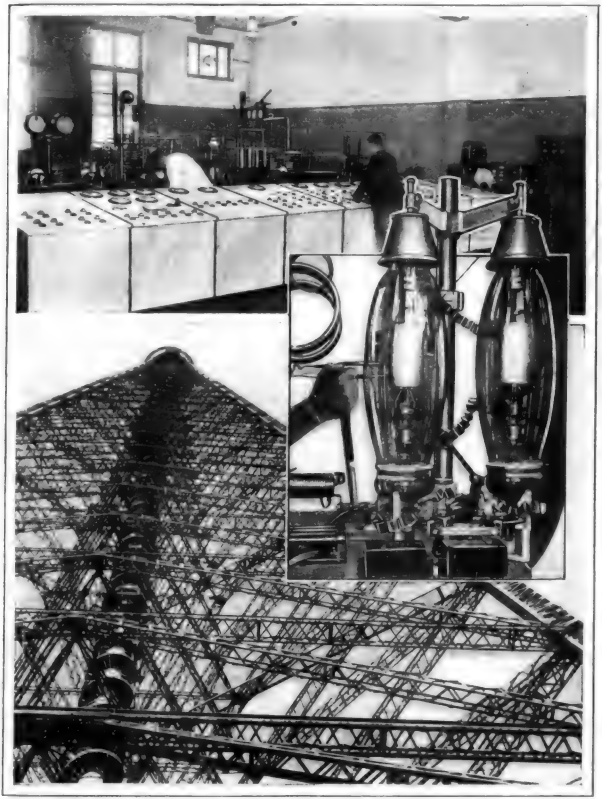
A Hat Brush for the Hand Bag

EVERY once in a while someone, somewhere, produces a novelty that combines utility with usefulness. Such is the case of this novelty hat brush that is small enough to fit handily into a hand bag. It is made with the same degree of thoroughness as any of the larger brushes made for this purpose, the bristles being wound and secured into a twisted wire frame.

Chinese 'Brellas of Yank Paper

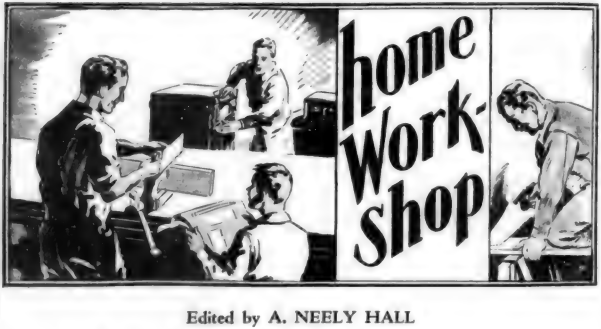
THE Department of Commerce reports that American kraft paper is replacing Chinese paper in making waterproof paper umbrellas. American kraft is cheaper and less likely to adhere and tear when the umbrella is opened. This business in China is a growing industry. The paper umbrella is popular in China.

Germany Aims for World-Wide Broadcast



GERMANY'S bid for world-wide radio broadcasting was recently made when giant stations at Kienigswusterhausen and Seesen were opened. Both of these stations are near Berlin from where remote control programs will be transmitted.

Some idea of the size of these stations will be gathered from the pictures above.



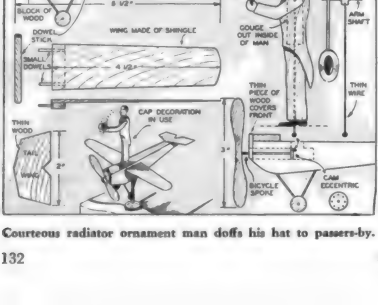
Edited by A. NEELY HALL

Mr. Hall, editor of this department, is well known throughout the country as author of such familiar handicraft books as "Outdoor Boy Craftsmen," "Big Book of Boys' Hobbies," etc. In these pages of Modern Mechanics he presents every month plans for building things out of wood and metal in the home workshop.

Wooden Man Tips Hat to Public From Auto Radiator

A NOVEL ornament for the automobile radiator made up of a small airplane in which a wooden man stands upright in the cockpit and waves his hat jauntily whenever the car is in motion can be made from odds and ends picked up around the house. The propeller of the airplane, driven by the motion of the car, furnishes power which is transmitted to the arm of the wooden man through an eccentric cam.

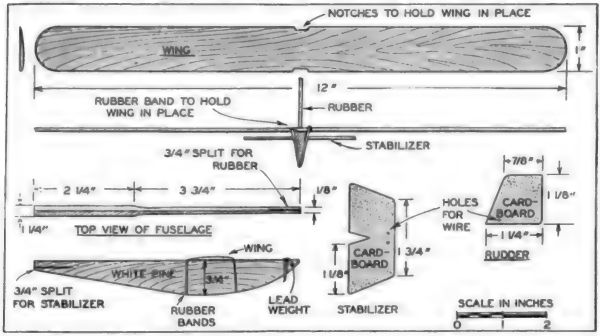
A study of the drawing will give a clear idea of how this interesting contrivance is built. The fuselage of the plane can be made from any close grained wood, and its shape can largely follow your individual preference. Length should be approximately 5½ inches. A ⅜-inch hole is bored through the nose of the fuselage, and a similar hole bored through for the cockpit to form an opening as shown by dotted lines in the drawing.



Courteous radiator ornament man doffs his hat to passers-by.

A pinion siding from an ordinary clock gear makes a good cam eccentric to operate the arm of the polite pilot. This is fastened rigidly to the end of the propeller shaft with a little solder. The cam runs on the wall of the hole bored through the fuselage. The three-inch propeller is carved from soft pine. Since the propeller is vital to the successful operation of the toy, be sure that its blades are wide and of a steep pitch which will give the shaft a strong thrust in a heavy wind.

Barrel Rolls and Loops Are Easy Stunts for This Glider



By bending the stabilizer and rudder and changing the angle of the wing with the fuselage, this glider made of white pine will perform all sorts of aerial acrobatics, including loops and rolls.

THE glider shown in the drawing above is made of white pine, which gives it enough weight for considerable speed. It can be made to barrel roll, loop, tail spin, and do several other stunts by changing the position of the wing on the fuselage and by bending the rudder and stabilizer.

Make the wing of a piece of white pine a foot long, one inch wide, and an eighth of an inch thick. Shape it flat on the bottom with a cambered top surface as shown. Cut notches at the middle for the rubber bands which hold it against the fuselage. Cut the fuselage from a piece of pine 6 inches long, shaped as shown in the drawing. A slit is cut in the rear to receive the tail group.

Rudder and stabilizer are cut from cardboard ¼-inch thick. A small wire run through stabilizer and rudder and twisted together holds them securely. Put enough lead in the nose to balance the fuselage about two inches back from the front tip. Now mount the wing in place with a strong rubber band, adjusting its position until correct balance is obtained. The glider can be launched with a rubber cord if a pin is put into the plane nose to serve as a hook. Some dihedral makes the glider more stable, but decreases its performance.

The radiator shield, made from thin cigar box wood, is the bearing on which the front of the propeller shaft rests. Perhaps the most difficult operation is the making of the mechanical man, who stands 4½ inches high. The body is cut from a piece of wood 3½ inches long, 1¼ inches wide, and about half an inch thick. The cutting is best done with a scroll saw.

With a sharp chisel, gouge out the inside of the body as illustrated. The arm-operating shaft is a piece of stiff wire bent as shown. Insert this in the opening and shape a cover to fit over the hole, which acts as one of the supports for the shaft. When the man is painted, this fit-in cover will not be noticeable.

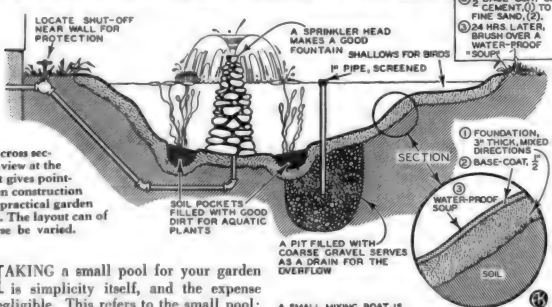
Arms, head, hat and shoes of the little man can be carved separately. By fastening a dowel between the legs of your little figure and jointing this dowel to the top side of the fuselage directly behind the cockpit the wire eccentric will operate to best advantage. If you experiment a little with the length of wire between the eccentric and the arm shaft the figure can be made to do many unexpected flourishes when the car is in motion, responsive to the effect of the wind on the hat. The tails and wing of the plane are perhaps most easily made from pieces of shingle, glued to the fuselage or fastened with lollypop stick dowels as shown in the diagram.—Willie Ryan.

Small Garden Pool Reflects the Beauty of Surroundings

and pollywogs may sun themselves. Besides, shallow pools attract birds that are afraid to bathe in deep water. However, at some part of the pool have a deep place, at least 18 inches to two feet, so that fish can seek a cool spot in extremely hot weather. If your pool is shallow all over the water will heat quickly and also evaporate.

Having made your excavation at least four inches

Reflecting the greenery around it, a garden pool like the one above makes a real beauty spot. Its shallows attract birds, and its cooler depths make excellent pools for goldfish to cavort in during hot weather.



The cross section view at the right gives pointers on construction of a practical garden pool. The layout can of course be varied.

MAKING a small pool for your garden is simplicity itself, and the expense is negligible. This refers to the small pool; the larger ponds with elaborate rock work, bridges, etc., are something for one experienced in such construction.

Select any location, though a spot on the higher part of your back yard is preferable because the water can be siphoned out with a hose, and during heavy rains mud and refuse will not wash into it. A circular basin is the easiest and most economical to make, but a much more artistic effect is achieved with irregular outlines — little bayous and lagoons where your goldfish

Boards nailed lengthwise may be used to make the bottom of your mixing boat, instead of metal.

deeper than the finished dimensions, fill it with water to soak in over night, in order to pack the soil firmly.

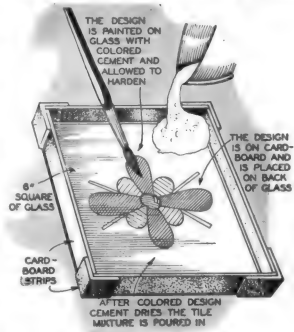
You will save much time and labor by making a mixing "boat" for your cement and concrete. The dimensions given in the illustration make a convenient size and take a standard sheet of galvanized iron, 23x36 in., for the bottom. If you do not care to go to the expense of the galvanized sheet, use boards nailed the long way, bringing them as tightly together as possible. Perhaps there is building construction under way in your neighborhood; if so, this is a convenient source of sand, gravel and concrete at current prices.

Making the Foundation

The foundation course is made of one part cement, three of coarse sand, and four of gravel. This can be measured with a shovel, and add enough water, after mixing dry, to form a pasty mixture. Lay a three-inch course over the entire pool and allow it to set about 24 or 36 hours. Now mix cement and fine sand in the proportion of one to three, with enough water for a pasty mixture, and spread this over the foundation course to the depth of about half an inch. This should give a smooth surface all over. In another day or two, paint it thoroughly with a mixture of waterproof cement and water. This should be of a soupy consistency, and should be worked into all crevices and holes. This will make your pool absolutely waterproof. Keep it moist with a sprinkler or nozzle after it has set enough so it will not wash down. On the third day you can fill the pool to the very top and leave the water in for a week or so. After this it is well to change the water once or twice before putting in fish or plants, so that all alkali is removed.

For a more elaborate and larger pool, with fountain, drain and water plants, piping must, of course, be laid before any concrete work is constructed. Below the bottom of the pool dig a pit about three feet deep and two or three feet in diameter to be filled with gravel and rock for your overflow drain. Place your drain pipe so that the screened cap on top comes exactly where you wish your water level. The standpipe for fountain should be at least three inches above this, or as much higher as you wish. A brass sprinkler head serves nicely as a fountain sprayer.

How to Make Decorative Tiles

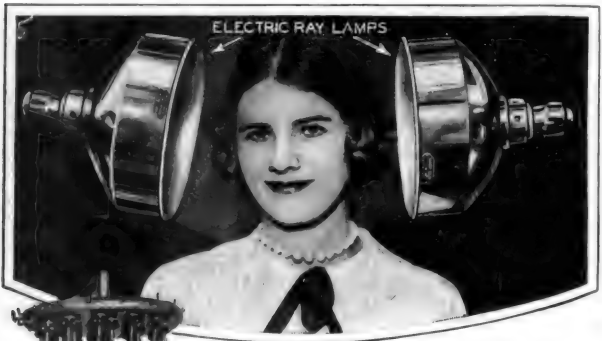


THERE are all manner of uses for decorative tiles, and making them is very interesting and pleasant. This method suggested is not new, but is one that not many people have tried.

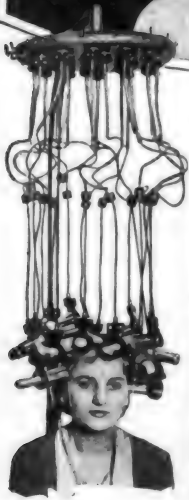
For equipment you will need a glass about six inches square (ordinary window-glass), a cardboard strip about one inch wide and 24 inches long with some gummed paper or adhesive tape for holding the cardboard securely at right angles at the four corners, two brushes of different size (water color brushes about Nos. 3 and 5), some colored cement which comes ready prepared and equal parts of sand, cement and water.

First draw the design you wish to use on paper, a simple one it must be for intricate lines are not so well carried out with the materials you have to use. Next oil the one surface of the glass and when you have the cardboard strip closely bound about the glass edges to form a box, oil the inside of the strip also. With the smaller brush "flow" the colored cement on the design. While the design dries you have time to mix the sand, cement and water for the tile proper. Work the two dry ingredients together first, then add the water a little at a time until the mixture is about like batter. Pour the cement into the box and gently shake the whole thing to help settle the cement. Place the tile in a cool damp place to harden.

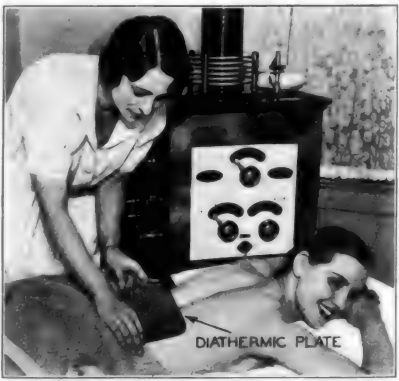
BEAUTY in DISTRESS



Here is demonstrated electric ray lamps shown at the annual Hairdressing Fair of Fashion in London. They are of the very latest pattern and are beneficial to the skin and hair.



Above is shown one of the newest electrical devices for permanent waving of milrdy's hair also demonstrated at the exposition in London.

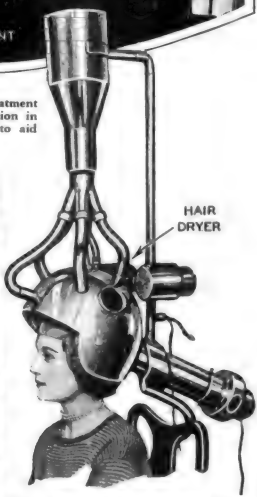


Dorothy Peters applies a diathermic plate to the back of Helena Lundh in Chicago to invigorate the body and to build health.

is AIDED *by* SCIENCE

Dr. Maurice Udell shows Leona Wilms the baking treatment for circulatory disturbances, at a Chiropodists' convention in Chicago. The baking treatment stimulates circulation to aid in banishing unsightly foot difficulties.

Photo of anatomist in Paris showing suitable coiffures.



Here is a fast hair dryer which was one of the many beauty aids demonstrated at the London exposition. There the most modern mechanical means of aiding beauty of headdresses were revealed by specialists. Looks like a torture machine!

A Portable Machine

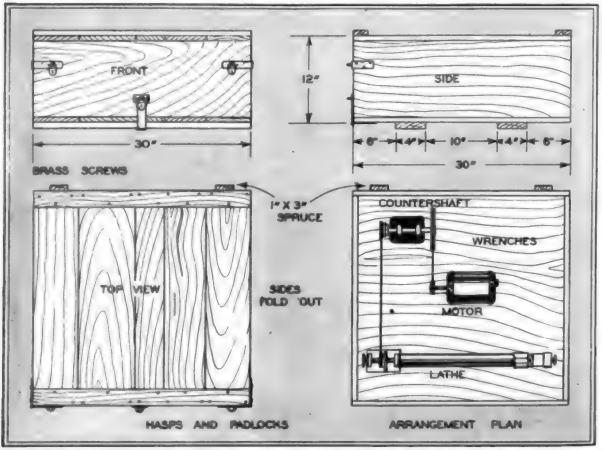
by GUS ADELBERT DECKERT

Complete lathe in box no larger than suitcase—things that can be made with it—how to know a good lathe—wood turning and pattern making.

FUNDAMENTALLY the lathe is the most important tool in any home workshop; all machine work depends on it. A lathe not only turns wood or steel to a round true shape, but it will also drill holes, face off metal castings, and do practically any kind of metal cutting except out and out hack-sawing. Drill presses and milling machines are just specialized variations of the lathe. All of which merely goes to prove that the home machine shop can't claim to be completely equipped unless it boasts a lathe.

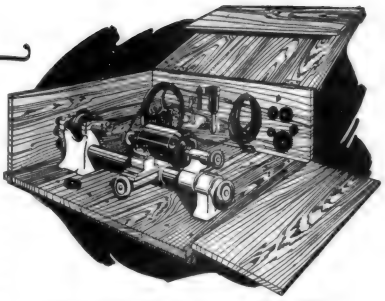
If the workshop is in the basement at home, dampness is likely to rust a lathe considerably in a few months' time, unless it is well protected. Then, too, it is frequently advantageous to have your lathe so arranged that it can be locked up out of the reach of prying or inexpert hands which might damage it. These and other considerations led the writer to build a box for his workshop lathe as shown in the accompanying pictures.

My lathe is a moderately priced affair of the type popular among model makers and men who do light machine work. It is screw-cutting, the only worthwhile kind to buy for metal working as well as wood. It will cut screw threads, make smooth machined rods, shafts, etc., doing the whole



Dimensions of the lathe-containing box, showing arrangement of lathe, motor, and counter-shafts.

Shop in a Box



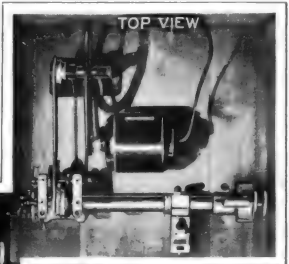
Top and sides fold flat for a working surface.

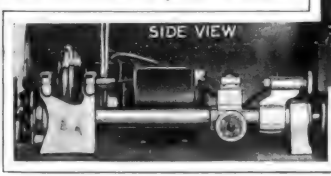
job without having to send away for parts. Several interchangeable gears which drive the screw feeding the cutting tool carriage come with the lathe, giving any speed desired for producing fine or coarse threads. Such a lathe is well worth the slight additional cost over the non-screw-cutting type.

At first thought it seems impossible to mount motor, lathe, and countershaft in a box small enough to be easily portable and one which can be locked handily with a padlock. Measurements of the parts, however, will show that a box 30x30x12 inches, approximately the size of an ordinary traveling bag, will house the whole works, allowing you to house your lathe safely in a somewhat damp basement.

Dimensions of the box are shown in the drawing. The top folds up and the sides fold down, allowing free working space when the box is opened. Hinges are fastened blind so that there will be no protruding edges to knock about and catch against objects. The top is tied together with 1x3 spruce at the extremities of the cross planking, and 2x4 bearers are used under the boards of the bottom. Brass screws are used to make a staunch, durable job of it. When completed the box is given a good painting with boiling hot linseed oil, which will soil, to be sure, but grease can be wiped from it and the finish will not bruise like varnish or paint. The whole box weighs only eight pounds, and you can carry it along with you on summer vacations, setting up shop wherever there is a supply of electric current available for the motor.

Motors of these small shop lathes are constant speed, and to get a variable spindle speed on the piece you are cutting between the centers of the lathe, pulleys of graduated sizes are provided. The fastest pulley is used in turning wood in which you stand in front of the lathe while the piece spins around at a high rate of speed, and cut it with a chisel as it turns.





These photographs give an accurate idea of the concise layout of the lathe and its parts inside the box. Almost anything in metal can be constructed with a lathe like this, up to 5" in diameter.

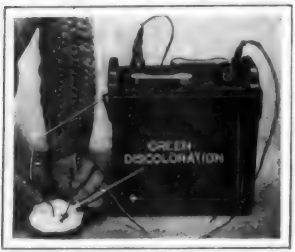
Edited by L. B. ROBBINS

Mr. Robbins, editor of this department, is owner and operator of amateur radio station WIAFQ. He is known to radio fans throughout the country as an expert in his field. More than 8000 articles by Mr. Robbins on various phases of radio have been published in technical magazines. This department appears monthly in Modern Mechanics.

Proving Line Polarity of Storage Battery With a Potato

OF COURSE anyone can prove the polarity of a storage battery by the markings on the posts or by the use of a DC voltmeter, but how are you going to check up on it without any markings or instruments? This is a simple matter and can be done almost anywhere if a potato can be procured.

Clip a couple of wires on the battery terminals and then cut a potato in half and lay one part on its back so the severed surface is uppermost. Touch the wet face of the potato with the two wires, keeping them about an inch apart. Gradually you will notice a green spot form around one of the wires. This indicates that the wire is attached to the positive post. The other, of course, must be the negative. It's a sure test and a simple one.



Positive wire produces green color on a potato.

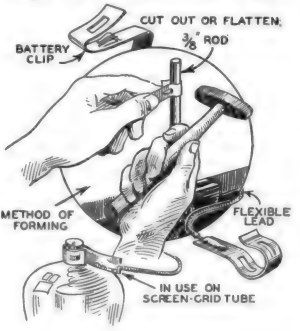
Spaghetti-Insulated Wire

IN MANY of the old style receivers will be found bus bar wiring. This was all O. K. when low power was used, but now that up to 450 volts or more are used in power amplifiers it is practically necessary that any bare leads be covered to prevent possible shorts. When the wiring is bolted in, this is simple, but when the ends of the leads are soldered the problem becomes more complicated. A simple method is to apply spaghetti to fixed leads. Cut two lengths of spaghetti to fit. Lay them on a smooth board and then, with a very sharp knife, split each one down its length so it can be laid open. Lay one piece over the wire with the split uppermost. Shellac it well and then open the second piece, split down, and press it down over the first piece, shellacking this one so it thoroughly adheres to the other. In a short time the two pieces will be cemented together and the wire will be doubly insulated without removing it or disturbing the set.

C or B Battery Furnishes a Clip for Screen-Grid Tube

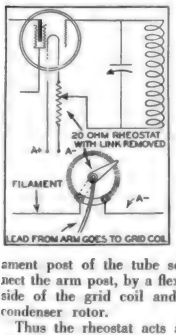
YOU radio experimenters and set-builders who find yourselves searching through piles of antique radio junk for something to serve as a clip for the cap on a screen-grid tube, take notice and stop at the old worn out "C" or "B" battery. If this battery has the usual Fahnstock clips for leads, tear into it, discarding everything but the clips which are formed as shown in the illustration. This may be done in two minutes with a light hammer and a rod or other object having a diameter of 3/8 in.

This clip provides a better connection to the cap of the tube than is possible when using the ordinary storage battery clip, and the appearance is much better. The tongue of the Fahnstock clip is either cut out or flattened down, and a few taps with the hammer will round off the end to fit the tube cap. The end of the flexible lead is soldered to the clip as shown.—W. T. Claytor, Jr.



Grid Bias Control for Screen Grid

THE quality and efficiency of the screen grid tube depends upon proper grid bias control. The accompanying diagram indicates a simple method of subtracting or adding grid voltage by means of an ordinary old style rheostat placed in the filament minus lead.



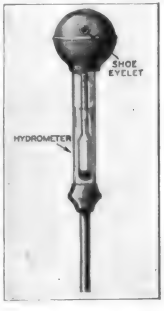
First remove the link connecting the variable arm of the rheostat with one side of the resistance winding. This leaves the resistance entirely open. Connect one side to the A minus lead and the other terminal to the filament post of the tube socket. Now connect the arm post, by a flexible lead, to one side of the grid coil and to the variable condenser rotor.

Thus the rheostat acts after the fashion of a potentiometer by which the ratio of minus to plus grid voltage can be altered to suit the conditions of the circuit and the necessary bias.

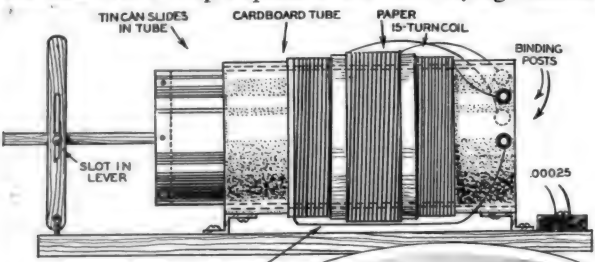
Finger Release for Hydrometer

THERE are still a multitude of storage battery receivers in operation and, with probably all of them, the battery has to be tested periodically with the hydrometer. To overcome the slight dripping of battery acid after the test and to regulate the height of the liquid at any desired point without squeezing the bulb is a simple matter.

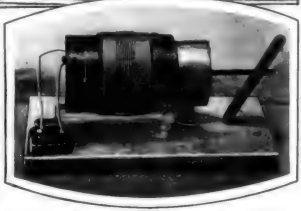
Punch a small hole in one side of the bulb just where the thumb will rest. Then go to the shoe store and get a brass eyelet and insert it in the hole as shown below. When the bulb is squeezed, hold the thumb over the hole. By releasing it air will be admitted and the liquid will flow out until the thumb is again placed over the hole. This makes it easy to regulate and control the amount of electrolyte at any time. The hole cut to receive the eyelet should be sufficiently small so that the elasticity of the rubber will hold the eyelet firmly in place.



Tin Can Wave Trap Separates Out Close-Lying Stations



Elements of a tin-can wave trap which adds surprisingly to a set's selectivity are shown above.



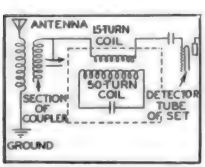
The wave trap completed, ready for installation.

WAVE traps are still in use. In fact, they have to be used on the older style receivers in order to clear up to any degree the hetrodyning and interference from stations broadcasting on close-lying waves. But a great many wave traps, although giving some relief, do not entirely remedy the trouble. Here is a wave trap that will actually help and it will be found far ahead of the coil and condenser type. It actually eliminates the unwanted station without lowering the signal strength of the one you are after. It is simple to build and moreover it costs practically nothing.

First you will need a clean tin can something like a small baking powder can, about 3 or 3½ inches long by 2 inches in diameter. Clean off all the paper and cut out the bottom. Then fill in both top and bottom with disks of wood, tacking the can edges to them all around. Drill a ¼-inch hole through the exact center of each disk and then drive a piece of dowel or skewer through them both, allowing about 6 inches to project from one of the disks.

Now get a piece of bakelite or cardboard tube just large enough so the can will slide nicely inside. Cut off four inches, shellac it if cardboard, and then wind on about 50 turns of No. 20 or No. 22 DCC wire and attach to binding posts at the end of the tube. Over this winding wrap a turn or two of paper and shellac it down. Then wind on 15 turns over the paper and over the center of the 50-turn winding. Attach these ends to two more binding posts.

Mount the tubing horizontally to a wood base with a pair of small metal angles as shown. Insert the can in the tube; then drill a small hole in the end of the dowel. Directly below the dowel but about 1 inch out from the hole, pivot a toggle lever so it will stand upright against one side of the dowel. Cut a vertical slot in this lever and then run a small horizontal bolt or pin through the hole and slot. This allows the can to be pushed in or out of the tube by moving the lever forward or back. Fasten



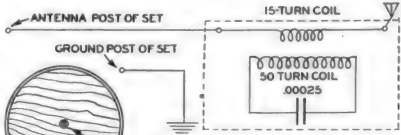
This drawing shows how to install the wave trap if your set employs an untuned primary.

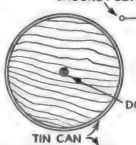
Tin Can, Cardboard Tube, Dowel Sticks Make Up Home-Made Trap

a .00025 fixed condenser to the base and shunt this across the larger 50 turn coil.

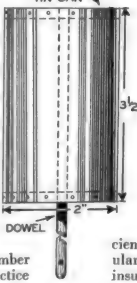
For connecting this trap proceed as shown in the diagrams. If your set has a tuned primary simply connect one end of the 15 turn coil to the antenna post of the set and the other end to the antenna itself. If the set employs an untuned primary open the lead from the coupler or condenser to the grid condenser and connect the 15 turn coil in series with it. The 50 turn coil remains the same as before.

To tune in a station do as you ordinarily would in tuning and if another station interferes pull or push the can in the tube until it is eliminated. Then retune your wanted station and you will be surprised the way the unwanted member will disappear. A little practice will enable you to get surprising results with this little wave trap. Cost of construction is so slight as to be negligible, and the additional pleasure derived from operating a set equipped with one will be ample repayment for the time and effort spent in building one.



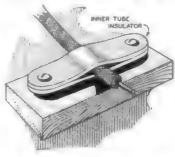


If your set used a tuned primary, hookup as shown in this diagram.

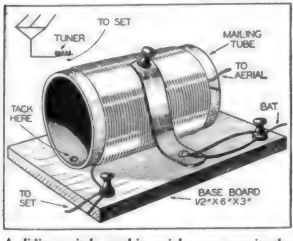


Inner Tube Wire Insulator

IN WIRING up electric wires for temporary connections, which must frequently be done by radio experimenters and others working with electricity, a handy means of insulation is much to be desired. The drawing below shows how two strips of rubber cut from an inner tube can be used for this purpose. The rubber is cut in the shape of a rectangle about one inch long and the two pieces mounted to the wood base by screws or nails through the ends. Such an arrangement is just as efficient as a regular porcelain insulator, and the wire can easily be removed when desired. Natural elasticity of the rubber keeps wire in place.

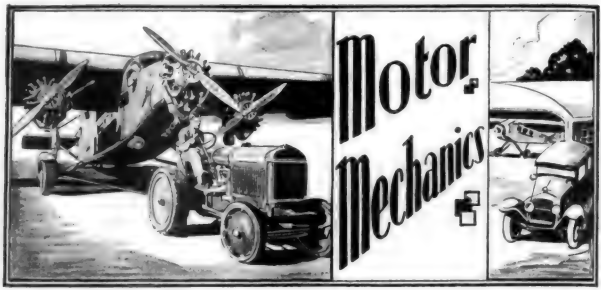


Aerial Tuner Helps to Do Away With Fading; Eliminates Much Static



A sliding switch on this aerial tuner permits the amount of wire in the aerial to be adjusted at will.

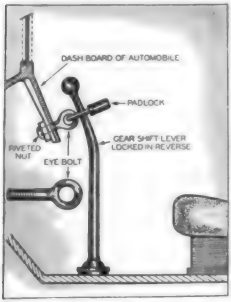
GROWLS and crackles and much other unnecessary and undesired noise can be eliminated from your radio receiver by an aerial tuner built after the diagram at the left. Its construction is very simple. A mailing tube is used as a base for winding 100 turns of No. 28 bare wire, which makes the coil. One end of the coil goes to a terminal. A brass switch, mounted on a pivot so that it can be slid to different parts of the coil, is connected to another terminal, and the whole connected with the set as shown in the wiring diagram. By sliding the switch along the coil you increase or decrease the amount of wire in the aerial and fix its wave length to correspond with the reception.



Edited by RAY F. KUNS

Mr. Kuns, editor of this department, is principal of the Automotive Trade School of Cincinnati, Ohio, and a nationally known expert in his field. He is also editor of the Automobile Digest, national auto trade journal. This department of motor hints is a regular monthly feature of Modern Mechanics and Inventions.

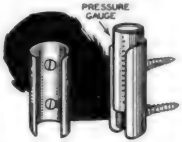
Padlock and Bolt Make Good Gear Lever Lock for Car



NEWLY purchased cars these days come with ignition or steering locks as part of their equipment, but older cars, many of which are still giving their owners excellent service, were not always fitted with adequate theft-prevention devices. Then, too, locks frequently go wrong, and an additional safeguard is required by the motorist. An ordinary padlock makes an excellent lock for the gear shift lever when arranged as shown in the drawing at the left. An eyebolt is fitted to the dash, its position being determined by the location of the shift lever when it is thrown in reverse gear. The eyebolt is held securely in place by a riveted nut. The hasp of the padlock is inserted through the eyebolt and around the gear lever, as illustrated, so that when locked the lever is held immovably in place, thwarting the thief who might wish to make off with the car. It is important that an eyebolt of just the right dimensions be obtained to give the most satisfactory results.

Holder Keeps Tire Gauge Conveniently at Hand

INFLATING tires is rather a nuisance at best, which accounts in large measure for the widespread neglect of this essential item of car maintenance. Construction of a pressure gauge holder like the one shown at the right will provide a permanent reminder for the motorist that tire wear is dependent on proper inflation. A bit of spring steel, shaped as shown, is mounted on the dashboard or at the side of the driver's seat with two screws.



Parking Your Car Is Easy, If You Follow These Rules

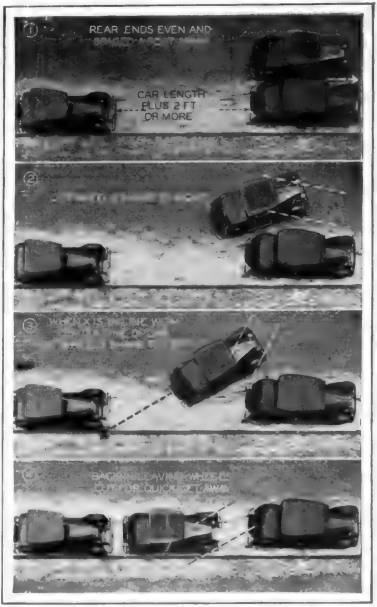
PARKING the family bus in a space not much longer than the car itself is easy—when you watch an expert chauffeur do it—but something terrible to behold when attempted by a novice who has never learned the correct procedure.

It is really simple to do, once you have mastered a few easy rules. Pick out a pair of parked cars on some quiet street, with just room between them for your car. Drive alongside the front car, with a distance of one foot between its outer wheels and your inner ones, and stop with the rear wheels of the two cars on a line.

Next cut your front wheels hard over to the right, reverse and start backing. The front end of your car swings outward and the rear goes back into the parking space. Continue backing until you see that your right front fender will just clear the rear bumper of the parked car. Stop backing, cut the wheels over as far to the left as they will go, and let the car ease back into the space.

If the maneuver is properly performed you will come to a stop with your rear wheel close to the curb, your front wheel against the curb, and your wheels pointed so you can get out of the space again without any trouble. The whole trick is to approach at the proper distance from the parked car, stop with the rear wheels on a line, and turn your front wheels each time while standing still. Most failures to park properly are due to the fact that the car is moving out of proper position while the wheels are being turned.

Study the diagrams, and then try this a few times on some quiet street. After that your parking difficulties are over for all time. Never try to enter a small parking space head first, since this puts the car in such position that parking is all but impossible.

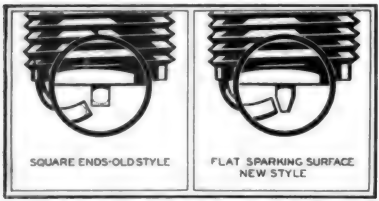


Four steps in the parking of a car in a space only two feet longer than its own length are shown above. Dotted lines indicate position taken by front wheels in the operation.

Cold Weather Driving Made Easy

CHOKE the engine a bit when stopping at night, in cold weather. Leave the choke on when starting the next morning. When the engine starts push in the choke gradually. This gives your battery its best chance. In cold weather the battery is only half as efficient and the motor twice as difficult to crank. If the car won't start, check the spark plug gap. It should not exceed .027-inch. Chains for front wheels are a great help. Four chains and four-wheel brakes have something in common—safety.

Electrode Design for Spark Plug Gives a Hotter Spark

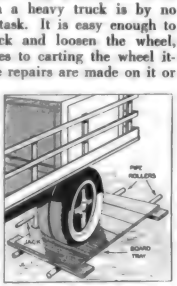


Changes in spark plug electrode surfaces produce stronger sparks.

SPARK plugs, like all the other parts which go to make up the modern motor car, are subject to refinements. In the old days mechanics were familiar with a great variety of special spark plug electrodes of special design, but in the long run nothing has been found superior to the conventional wire electrodes. The spark plug at the left of the accompanying drawing shows the ordinary square end wire electrode, which gave good service, but which, when rounded as indicated by the dotted lines, performed even better. More recently another refinement has been added, as indicated by the magnified section in the right half of the drawing. Here it will be noted that the center electrode has been beveled and the curved wire left with the end square. This provides a flat surface for the spark to jump. According to engineers, a stronger spark is secured and gasoline economy results.

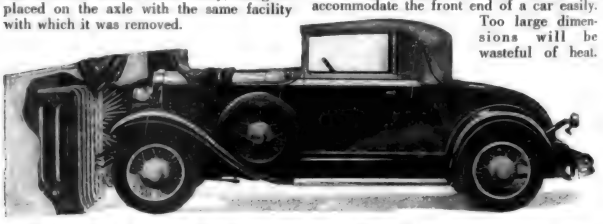
Removing Wheels From Trucks

OWING to their weight, the removal of wheels from a heavy truck is by no means a simple task. It is easy enough to jack up the truck and loosen the wheel, but when it comes to carting the wheel itself around while repairs are made on it or a tire changed, it's a different matter. A simple way of simplifying the task is to construct a small platform of boards, as shown in the drawing, sliding this under the wheel on pipe rollers, running on supporting boards on the ground or floor. When loosened, the wheel rests on the board tray and it can be moved about easily, being replaced on the axle with the same facility with which it was removed.



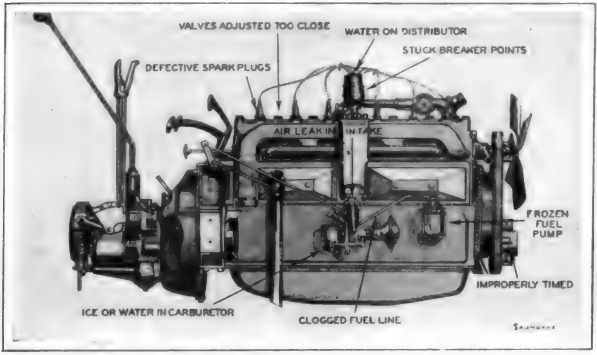
Thawing Out the Frozen Car

CARS usually freeze while being driven along the street, and the harried driver, running into a public garage, naturally wants to have his car thawed out in a hurry. If a metal hood is built over one of the steam radiators in the garage, as shown in the cut-away drawing below, the thawing process can be greatly speeded up. Blankets draped over the open edge of the hood will retain the heat and concentrate it against the car radiator. Have the metal hood large enough in width and height to accommodate the front end of a car easily. Too large dimensions will be wasteful of heat.



Concentrating steam heat on the car radiator, a metal hood like this thaws out frozen cars quickly.

How to Find Out What's Wrong When the Engine Fails



This diagram shows a number of possible causes of engine trouble which may cause motor to stop.

DO YOU know what to do when the engine fails? Many car owners fail to get far from the beaten motor trails because they do not have sufficient knowledge or self reliance to correct common engine ailments. Some of us miss lots of fine trips through isolated regions because we are not familiar with what goes on under the engine hood.

Engine failure is a common trouble. The engine stops or refuses to start. The driver knows it takes gasoline and a spark to make the motor go, but what to do to determine if the gasoline is flowing and the ignition sparking is a difficult problem unless he is familiar with some simple tests.

To determine if the spark is functioning properly, detach a spark plug terminal and hold the metal about a quarter of an inch away from the plug while the engine is cranked over. A spark should jump between the two points. Opening the cock in the bottom of the carburetor shows the presence or absence of fuel. However, if the gas mixture is too lean or too rich starting trouble will ensue. Too rich a mixture will run down the starting battery without getting any results in the way of getting the engine going.

It is never advisable to use the starter more than twenty seconds at a time. After this period the driver should test to see if a spark and gasoline are both being obtained. If the engine spits back through the intake the mixture is too lean. If the engine is choked too much there is a heavy odor of gasoline at the exhaust, but the engine fails to start. Under this condition it is probably best to close the throttle, remove the spark plugs, and crank the engine for about twenty seconds to clear the cylinders. Absence of gasoline in the tank is, of course, sufficient reason for the engine to fail. Failure of fuel to flow to the carburetor shows obstruction in the fuel line, such as dirt or ice, and the only remedy is to clear the passage.

If the trouble is of an electrical nature, the driver should search for this from the battery through to the distributor. Most frequently a loose connection, broken wire, or similar trouble will be found. Coil failure is infrequent, but a shorted coil will show up by placing one of the car lamps in circuit. With a short the lamp will burn brightly. With a broken down coil the lamp will fail to light. Corroded or loose battery terminals are another cause of electrical failure. Loose ignition switches sometimes cause trouble through making imperfect connections. Other sources of trouble are pointed out in the chart above.

Building a Canvas Canoe

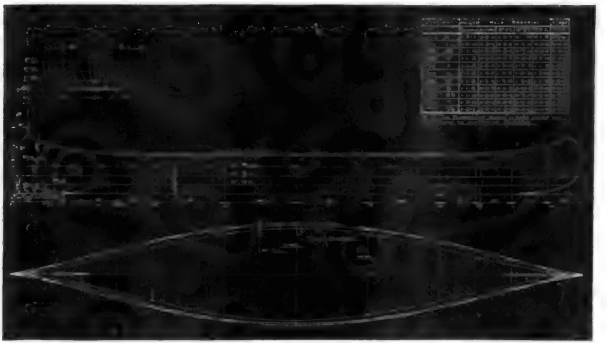
Only with a canoe can the full peace and beauty of nature be enjoyed. Above are canoes like Nedwidek's design.

This beautifully modeled canvas covered cedar canoe can be yours! You can build it yourself from these complete plans by a famous naval architect. The design is typical of the canoe found in all waters of North America and is of the type sold by well known builders. With ordinary tools any handy man can make himself this easy paddling craft.

by
CHESTER NEDWIDEK

THE plans shown herewith are that of a sixteen-foot overall canvas-covered canoe, with a beam of thirty-three inches. The various drawings are as follows, the lines which show the shape of the canoe, and the offset table. It is from this offset table that we get the dimensions for the various moulds. Then we have the construction plan, showing an inboard elevation of the canoe, also a plan view. The other drawing shows a construction section and detail of the stems.

Before we can actually start the construction, it is necessary that we lay down the lines full size, so we can construct our moulds; these are essential to shape the boat as designed. The offset table gives the dimensions for these sections as for example; take Station No. 4. The height for the gunwale on this station is given as 1-1-8, which reads one foot. one inch and eight-sixteenths of an inch. This is laid out from a determined base line. From this base line and perpendicular to it a center line is drawn, and three other lines parallel to the base line and spaced three inches apart, these are called water lines. The only other construction line we now need to draw on our full size body plan. is the diagonal. This is laid out twenty-four inches out from the center line along the base line and twelve inches above the base line on the center line, a line is drawn



These are the lines drawings of the canoe, and show the half breadth or top shape, the heights, or profile shape, and the cross-sectional shapes. The table in the upper right hand corner is a table of offsets. It gives the dimensions across and up and down at any particular station. This gives the scantling sizes for all pieces in the canoe. Note that it is a cedar hull, covered with canvas.

through these points giving us the diagonal. We have the vertical height of the gunwale. Now we locate this point horizontally, from the offset table this is given as 1-4-9 or one foot, four inches and nine-sixteenths of an inch out from the center line. With this it gives a definite point which is the height and width of section No. 4 at gunwale height of the planking. Now we locate the spots on the water lines. The width on the nine-inch water line is 1-5-8, one foot, five inches and eight-sixteenths of an inch. This is laid out from the center line. The points on the six and three-inch water lines are laid out in a similar manner. The only point left now is the one on the diagonal, this is 1-6-3, one foot, six inches, and three-sixteenths of an inch and is laid out from the centerline along the diagonal. Now with all the points for this section procure a light, thin wood batten that will bend around these points. Tack it in place, seeing that it cuts through all the points. from the inside edge, lay off the thickness of the planking and the frame which gives a total thickness of fifteen thirty-seconds of an inch, along these points draw a line. This line will then give you the shape of mould for stations No. 4.

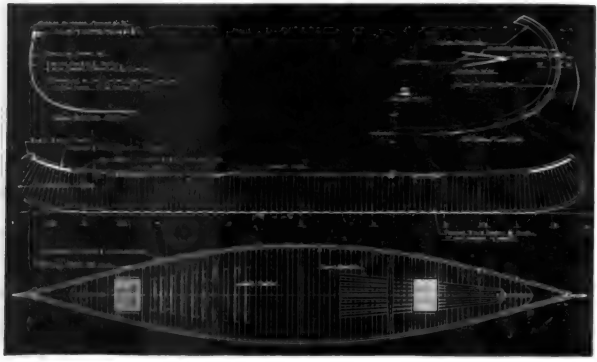
The moulds for the rest of the stations are obtained in the same manner. It will be noticed that the canoe is shaped exactly the same each side of station No. 4. So you will only have to lay out stations number ½, 1, 1½, 2, 3 and 4, making two moulds each of ½, 1½, 2 and 3.

The shape can be laid out on a large sheet of building paper such as used for building a house.

The profile of the stems should now be shown full size from the dimensions given on the lines. The stems are made in two pieces, the inside stem and the outside stem. The pieces should be steam bent to shape. In making them up leave off the outside stem as this is put on after the canvas is put on. The outside edge of the inside stems is to show a face thickness of one-half inch, this face thickness is carried from the stem head down. Allow enough thickness of stem to get a bevel so that the planking will lay flush along the inside stem.

Make the moulds of scrap lumber about three quarters of an inch thick. Make the moulds so that they can be taken out after the boat is planked. The boat is best built upside down. Properly locate all the moulds in their respective positions taking great care that they are plumb and parallel

The Blueprint Shows the Construction of the Canvas Covered Canoe



to each other. Place a temporary shore that will hold them in their respective positions, also secure the two stems in their proper places.

Get out some fairing battens of white pine, about three-quarters of an inch thick and about one and one-quarter inches wide, to be about seventeen feet long. Enough of them should be provided to space them about five inches apart on station four. The moulds should be notched out to receive them so that the outer face is flush with face of the mould. With these fairing battens in place we are now ready to frame the canoe.

The frames are to be of cedar, five sixteenths of an inch thick, two inches wide at keel and one inch wide at the gunwales. To be steam bent over the battens, spaced so that there is an inch and one-half spacing between them. They can be clamped in place until the planking is put on.

The planking is to be of white or red cedar five thirty-seconds of an inch thick, in narrow strakes about one and one-half inches wide amidships. Planking to be fastened to frames with short copper rivets, clinched over on the inside of the frames. The ends of the planks are to be screw fastened.

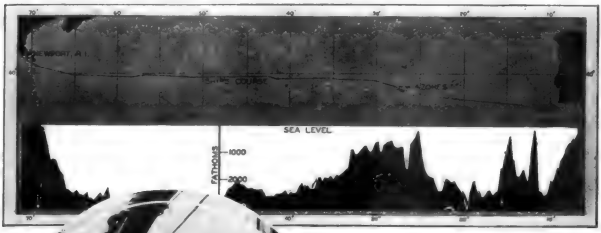
When entirely planked, the whole outside of the canoe should be sanded fair and smooth. The canvas is to be in one piece, No. 8. It can be laid in thick paint or glued on the hull with Jeffrey's Marine glue made especially for this purpose. Great care has to be taken to properly stretch the canvas in place so that no wrinkles occur as the ends of the canvas have to be split, being fastened together on the outer face of the inside stem, putting the outside stem in place after the canvas is on.

Now the moulds and fairing battens can be taken out, the canoe turned over so the inside can be finished.

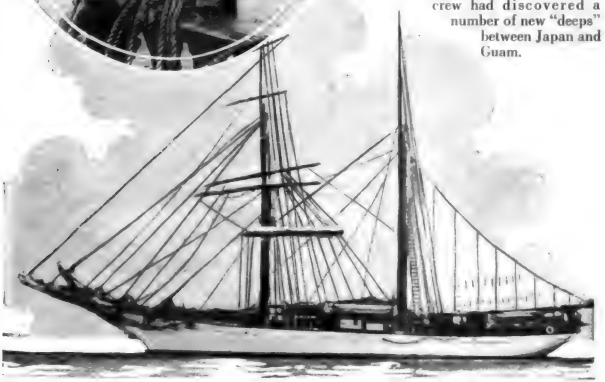
The inside gunwale is the next member to be fitted. Then the short decks fitted at each end. The thwarts and seats to be made and put in place, the location of these are shown on the drawings. The seats can be caned if one can do caning or else canvas can be stretched on in place of the caning. The bow seat should be placed a little lower than the stern seat. This can be done by using long bolts with a spacer between the seat and the thwart. It should be about three to four inches below the gunwales. Small light brass bang plates to be fitted on each stem. A floor rack can be made and fitted, this will save the bottom of the canoe.

The entire inside of the hull, the seats, thwarts and gunwales should be given at least three coats of good grade of spar varnish.

Explosion Halts Research Trip



THE complete demolition of the Carnegie, the non-magnetic ship sent out by the Carnegie Institute of Washington for the purpose of mapping ocean bottoms throughout the world, brings to an end an epoch-making research expedition. The ship, which blew up near Samoa, was to have traveled more than 100,000 miles, traversed every sea and would have crossed all latitudes between Spitzbergen at the north and the antarctic ice-fields of the south. Already, the ship's crew had discovered a number of new "deeps" between Japan and Guam.



The ill-fated Carnegie was entirely non-magnetic. Not more than a ton of steel, iron or other sensitive material was used in construction. Even the crew's uniforms had buckles and buttons of bone.

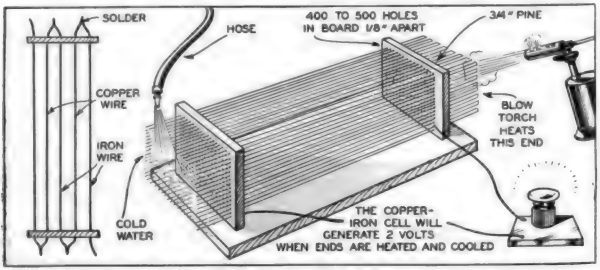
Edited by THEODORE ALLEN

Electricity is one of the most interesting fields open to the amateur experimenter, and the novel uses to which electricity may be put are endless. In this department every month Modern Mechanics presents plans for practical and interesting articles which can be built complete in the home workshop at very moderate cost.

Thermoelectric Battery Lights a Small Electric Bulb

DERIVING its energy from the potential existing between two heated metals when temperature differences are produced at opposite ends, the thermoelectric battery diagrammed below generates enough current to light a small electric bulb. From 400 to 500 lengths of copper and iron wire are strung between two end boards of white pine which are thin enough to permit fairly easy punching of holes through them with an awl. Length or size of the wires is not of much importance, but copper and iron must be strung alternately and their ends projecting through the boards should be twisted together and soldered.

One end of the cell, the iron end, is positive; the copper end is negative. Place the battery so that cold water from a hose or faucet plays on one end of the wires, and the flame from a blowtorch on the other. You will find that enough current is generated to light a 1½-volt bulb.



Cold water and a blowtorch flame played on the ends of this battery produce an electric current.

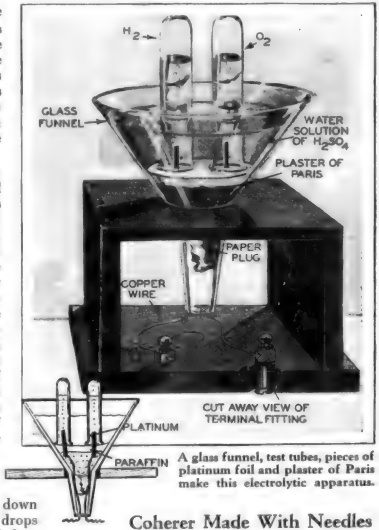
Simple Electric Device Produces Oxygen and Hydrogen

OXYGEN and hydrogen can be prepared in small amounts for experimental purposes by the simple apparatus shown in the drawing at the right. It consists essentially of a funnel of the glass type used in all laboratories, in which a water solution is broken down by electrolysis to produce the gases.

Platinum foil is used for the electrodes, since the oxygen loosed by the process of electrolysis is nascent and extremely active in combining with other metals. A quarter's worth of the foil will be sufficient. To the end of the platinum solder ordinary copper wire to lead to the source of current. The platinum electrodes are led through the bottom of the funnel as shown and a paper wad used to hold them in place. Next pour in a mixture of plaster of Paris so that it just covers the lower ends of the platinum. When this hardens a thin layer of paraffin poured over the plaster will make the bottom watertight.

Now pour into the funnel the water which is to be broken down into its component gases. A few drops of sulphuric acid should be added to the water to make it a good electrical conductor. Two test tubes full of water are inverted over the electrodes. When the current is turned on oxygen will bubble from one piece of platinum and hydrogen from the other piece, filling the test tubes with the gases. One tube will contain twice as great a volume of gas as the other, since there are twice as many hydrogen atoms in water as oxygen, as indicated by the familiar H_2O formula.

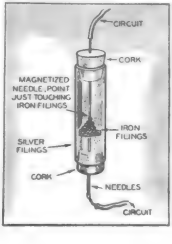
A storage battery of six-volt capacity, the size generally used on automobiles, is the best source of current for the apparatus. Considerable amusement may be derived from proving the explosive nature of hydrogen when mixed with a certain percentage of air or oxygen. A match or other open flame held in front of a test tube full of explosive hydrogen will cause it to go off with a bang like a miniature cannon.



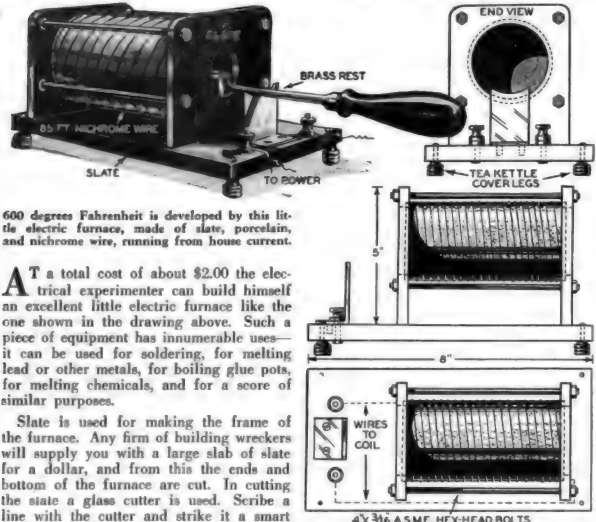
A glass funnel, test tubes, pieces of platinum foil and plaster of Paris make this electrolytic apparatus.

Coherer Made With Needles

A GOOD simple coherer made after the diagram below can be energized by radio waves, utilizing minute electric currents to close a circuit. Two magnetized needles are run through corks in the top and bottom of a glass tube, and the outer ends connected with the circuit. The inside of the tube has been filled with a layer of silver filings, topped with a layer of iron ones, which are just touched by the tip of the top needle. Relays in series can be energized by radio waves using this coherer.



Small Electric Furnace Costs Less Than $2.00 to Build



600 degrees Fahrenheit is developed by this little electric furnace, made of slate, porcelain, and nichrome wire, running from house current.

Dimensions of the furnace can be varied.

AT a total cost of about $2.00 the electrical experimenter can build himself an excellent little electric furnace like the one shown in the drawing above. Such a piece of equipment has innumerable uses—it can be used for soldering, for melting lead or other metals, for boiling glue pots, for melting chemicals, and for a score of similar purposes.

Slate is used for making the frame of the furnace. Any firm of building wreckers will supply you with a large slab of slate for a dollar, and from this the ends and bottom of the furnace are cut. In cutting the slate a glass cutter is used. Scribe a line with the cutter and strike it a smart blow with a trowel or metal straight edge to break the slate along the scribed line. There will be some rough projections from the broken edge, which can be smoothed off somewhat with a hammer and trimmed down with a coarse file.

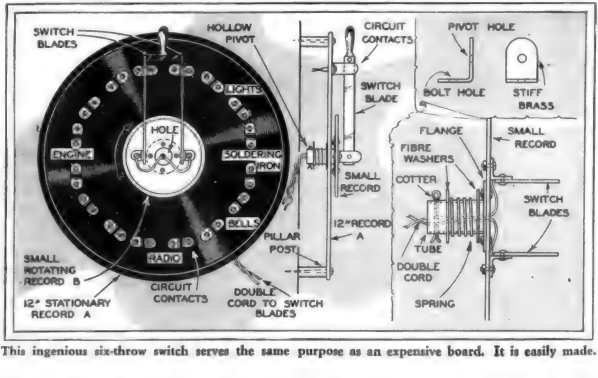
When the slate is trimmed to the desired size you are ready to drill it. This operation requires a special drill which you had best make for yourself. Heat an ordinary drill and shape it to a spade point—that is, a tip whose two edges extend outward at 45 degrees from the point. Such a drill works better than the ordinary type in boring slate.

Holes in the slate are needed for screwing the end slabs to the base and for putting in the battery terminals. Use the drill in an ordinary bit and brace. Pour a little water in the hole as you drill, which will make a paste of the dust, acting as an abrasive to help along the drilling. In screwing the end pieces to the base, the hole in which the screw fits is first drilled out and then filled with lead babbitt to give the threads of the screw something to "bite" on.

Four holes are required in each of the end pieces to accommodate the 4x3/16-inch A.S.M.E. steel bolts which hold the slates clamped to the porcelain winding in the center.

The winding is made around a porcelain element knocked from an old heater. Eighty-five feet of No. 24 B. S. gauge nichrome steel wire is wound around this from terminal to terminal, in a spiral. A recess is cut in the end slate with the sharpened tine end of a file, and a brass rest mounted to hold the tool. The furnace operates on ordinary house current and develops 600 degrees Fahrenheit. The bolts must have a little slack, since they expand under the heat developed and if tied at the ends would crack the slate.

Phonograph Records Make Double Pole 6-Throw Switch



This ingenious six-throw switch serves the same purpose as an expensive board. It is easily made.

THE writer, who does considerable experimenting, wanted some means of using one storage battery for many purposes. The expense of the usual type of switch board was out of the question but the problem was finally solved by the use of two phonograph records, a double pole switch blade from an old switch and various simple bits picked up around the shop. In this way one switch handle served for throwing the current into any one of six different circuits. This design was only intended for use with low voltage, but may be adapted for use with high power by careful construction and the use of high voltage wiring.

The base of the switch consists of a 12-inch phonograph record turned face to the wall or bench. A circle is scratched 4½ inches from the center and 5 inches from the center, leaving a half-inch track concentric with the center hole. Around this track is fastened with small bolts, six pairs of knife switch contacts, equally spaced in pairs and each pair as far apart as the blades of the switch. The circuit wires are attached to the switch contacts by being soldered to lugs under the bolts on the other side of the record. Each pair of contacts are named, as shown, by scratching into the record stock and filling the scratched letters with white paint.

The switch blades are mounted on a second or rotating panel composed of one of the little midget records purchased in the 5 and 10 cent store. A 4-inch disk can be sawed out of a larger record if the small records cannot be procured. Trunions for the blades were shaped out of stiff brass and then bolted to the disk each side of the hole as shown.

A small metal tube, soldered to a flange, was then bolted to the center of the small disk so the passage was absolutely concentric with the hole in the disk, which was enlarged the same size. The hole in the disk A was enlarged likewise. This tube was then pushed through the hole in disk A with a fibre washer between the disks, and a spiral spring, washer and cotter pin used to keep the two disks firmly together. This is shown in the detail sketch.

The switch blades were then wired to a double strand, flexible cord which was lead through the tube in the disk and connected to the battery. The whole assembly was then mounted to the wall by two screws through the edge of the large disk running through pillar posts to give a couple of inches clearance for the cord.

By rotating the small disk the switch blades can be thrust into the connectors of any circuit. Be careful to rotate in opposite directions when changing.—L. B. Robbins.

Vacuum Gearshift Perfected By Automotive Engineers

This new control device shifts automobile gears by vacuum control. It substitutes finger tip control for the shifting lever.

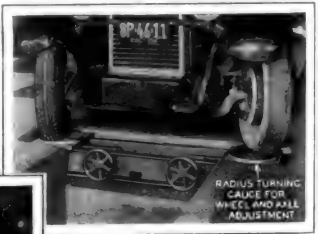
AFTER a period of seven years of research and experiments, a vacuum gear shifting device has been perfected which does away with the gear shifting lever commonly used on automobiles and enables the driver to do the shifting on the wheel by fingertip control, according to J. H. Newmark, New York automotive sales and advertising engineer for the automotive industry, and announced recently.

The vacuum gear shift, it is explained, requires a minimum of equipment and makes use of a natural element to shift the gears—the engine intake, used to create a vacuum. It requires only to remove the cover plate of the present transmission box and to apply a special one, in order to place the new gear shifting device on cars in use. This is done by attaching to vacuum tubing leading to two small vacuum cylinders mounted on a cross member at the rear of the transmission case.

Tire and Brake Testing Appliances Help Wheel and Axle Alignment

WITH the increased use of balloon tires, new problems in tire wear are constantly coming to the front and new methods of correcting faults are being developed.

Two of the latest machines designed to help wheel and axle adjustments have been patented by George A. Bells, of Los Angeles. One of these is a radius turning gauge. The front wheels are put on the discs of this gauge and the wheel turned from left to right. This gauge is so arranged that if the radius is at fault—if one wheel turns at a wrong degree compared with the other wheel—the exact variation from the correct radius can be detected and changed. Faults in radius turning are claimed to be one of the biggest reasons for excessive balloon tire wear.



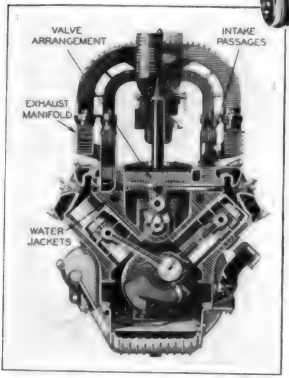
Both the micrometer and turning gauge are the inventions of Geo. A. Bells, Los Angeles.

The other machine is a micrometer square which instantly detects the difference in braking force.

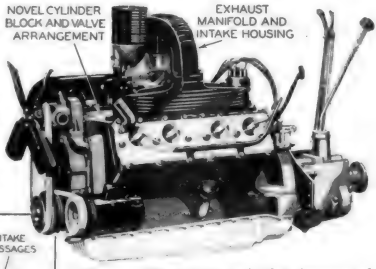
New Viking Eight-Cylinder Engine Developed by G. M.

GENERAL MOTORS is now producing the Viking, a V type eight-cylinder motor. Cylinder blocks are off-set and side by side construction is used for connecting rods on crankshaft throws.

The crankshaft is three bearing, counterbalanced. Instead of the shaft similar to four cylinder construction, this engine uses a shaft having two throws advanced 90 degrees over two



throws on the opposite end. This arrangement insures freedom from vibration and the tendency to "gallop" at high speed.



The new Viking motor is the first departure of G. M. from the line of standardized engine design.

Novel is the cylinder block and valve arrangement. This is quasi-overhead. That is, they might qualify as "overhead" but actually the valves are seated in the blocks and removal of heads leaves valves undisturbed. The cylinder block is one piece. It contains crank case, cylinders, crankshaft bearings, camshaft bearings, valve ports and seats. Provision is also made for bolting in bearings for the shaft, carrying 16 rocker arms. The arms are entirely enclosed.

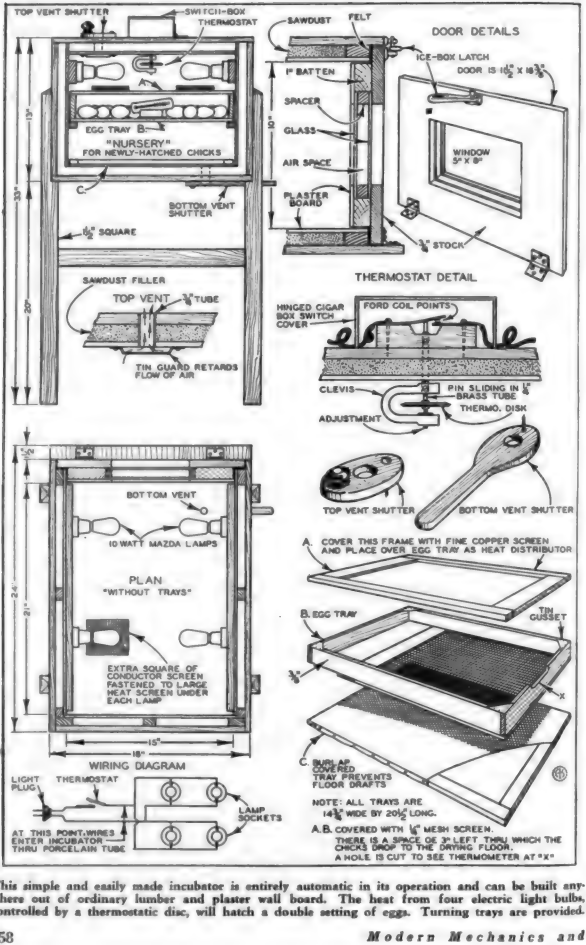
Valves are easily accessible for lifter clearance, which is effected in the upper arm ends. The valves are horizontal in assembly. They are 6½ inches long and pass on the inner ends due to staggered cylinder arrangement. When servicing valves intake and exhaust manifolds and cylinder heads are removed, along with the valve compartment cover.

Exhaust gases are carried to the right.

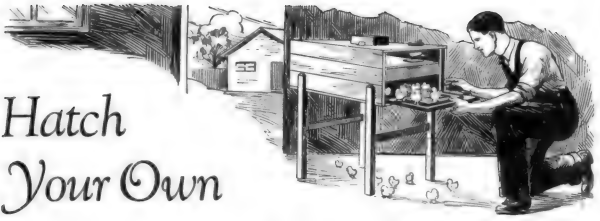
Youthful "Aviators" Reveal Air Interest Through Model Toy Purchases

AMONG new toys that reflect the influence of aviation is a sturdy sheet-metal Zep modeled after the new dirigibles being constructed for the U. S. navy. The toy is equipped with rubber-tired wheels in back and a furniture caster in front, and is propelled by means of a string attached to the nose. A ratchet arrangement on the wheels produces a noise that resembles that made by a ship's motors.

Accuracy in design and construction marks this toy Zep.



This simple and easily made incubator is entirely automatic in its operation and can be built anywhere out of ordinary lumber and plaster wall board. The heat from four electric light bulbs, controlled by a thermostatic disc, will hatch a double setting of eggs. Turning trays are provided.



Hatch Your Own Electric Incubator Chickens

by **HI SIBLEY**

CHICKS hatched under electric light bulbs are just as sturdy as those brought forth by a hen. Besides, it is much less bother to hatch them this way, as the writer has proved after considerable experience with erratic setting biddies.

About three months were spent in experimental work before we were satisfied with results, but having achieved our second brood with this home-made incubator we can recommend it to other amateur poultrymen. Anyone who can do ordinary carpentry can make this electric hen.

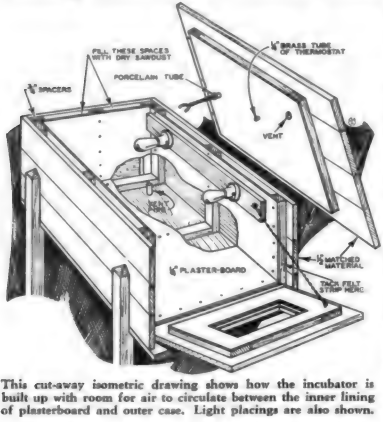
It consists simply of an outer shell of matched boards, inner walls of plasterboard with the interspace filled with dry sawdust, a thermostat switch, an egg tray and a door with double glass. The heating element is made up of four 10-watt Mazda bulbs.

Clear, matched material is best for the outer shell, and soft wood, such as white pine or redwood is preferred to hardwood, since it is a better non-conductor of heat. Half-inch boards are satisfactory. Battens about ¾-inch thick inside serve also as spacers, and the plaster board is nailed to these. It is important that all joints be drawn tight. Before putting in sawdust bore holes for top and bottom vents and the porcelain tube for the wires. Three-quarter-inch tin or brass tubing provides sufficient ventilation. Complete the bottom and three sides and install the four lamp bulbs before screwing down the top, and also set the thermostat in the latter.

For the thermostat it will be necessary to buy an expanding disk, or "wafer" and a U-shaped bracket called a "clevis" from some incubator manufacturer. The two can be purchased for about a dollar through your local hardware. The writer used ordinary Ford vibrator points for the switch contact, at 15 cents per pair. The diagram illustrates assembly of the switch and principle of operation. Experiment will determine the proper length of the vertical pin which breaks contact so that inside temperature will be maintained as near 103 degrees as possible. A screw at the bottom of the disk permits adjustment. When the four bulbs warm up the interior above 103 degrees, the disk expands, pushing the pin up and opening the switch, and as soon as the temperature drops below that point the switch closes again. It will be well to buy a standard incubating thermometer. They cost only 75 cents, and are specially adapted to this work.

Make the egg tray as shown, with ¼-inch mesh galvanized screen on the bottom except a space three inches wide at the end, where the newly hatched chicks can drop through to the "nursery" below for drying out before putting in a brooder. The secret of the efficiency of the bulb heater is the copper screen frame that sets over the egg tray. Copper, being a good conductor, distributes the heat evenly over the eggs, and uniform distribution is further assured by

Drawing Shows Electric Incubator Details



This cut-away isometric drawing shows how the incubator is built up with room for air to circulate between the inner lining of plasterboard and outer case. Light placings are also shown.

putting an extra square of screen under each bulb where the heat is the greatest.

A burlap-covered frame rests on the bottom and this prevents incoming air from the lower vent lowering the temperature in one spot. Ventilation is regulated by the shutters made up as shown in the drawings. A hinged cigar box is set over the switch to prevent anything falling against it and disturbing adjustment, or short-circuiting. It is also a protection against shocks. *Be cautious in handling the wires in testing,* and also be sure that all exposed portions inside are insulated with tape. It is a good idea to cover the edges of the copper screen with pasteboard strips.

The door is made up as per sketch, with a double glass window having an insulating air space between. Do your very best work on this door so that it will fit well. A felt strip helps keep it tight around the edges. Note that the floor boards extend 1¼ inches in front to carry the door hinges. They are put on this way purposely to facilitate fitting snugly.

It may be some encouragement to know that the writer never had any previous experience with incubators, and only saw the inside of one before making this job. Consequently it was a great thrill when the first comical-looking little chick cracked through under the spotlight.

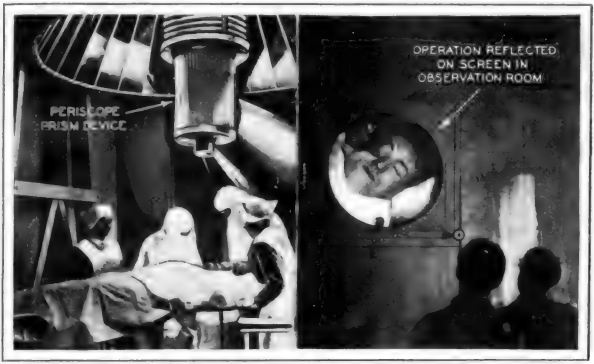
This size incubator accommodates about fifty eggs. Of course, you should have some assurance they are fertile before starting them off. Twenty-one days are required for chicks to hatch. For the first two weeks adjust the thermostat for about 102 degrees, and the third week 103 or 103½ degrees, and keep a shallow pan of water on the screen. After the first 48 hours the eggs should be turned over twice a day to prevent the germ sticking to the shell. On the eighth day begin cooling the eggs once every 24 hours until the hatch. By cooling we mean bringing down the temperature to that of the outside air. Noon is the best time for this, and the eggs should not actually become cold—but around 80 degrees or over. This is accomplished by lifting the tray out of the incubator until cooled. As soon as the chicks begin to crack the shell, cease turning and cooling and keep the door closed. When the hatch is completed put the chicks that have not already fallen through into the nursery, where the temperature is about 90 degrees.

Eggs can be candled, or tested, by placing over a hole in a pasteboard box and holding to the light. This should first be done on the seventh day, and if the egg has begun to develop there will be a dark area inside. Those which show clear should be thrown out. On the fourteenth day testing should determine the remainder of the eggs which should be discarded. It will be very apparent which ones contain potential chicks.

In about twelve hours the new chicks will have been dried out sufficiently to be transferred to the brooder, and a description of a very successful home-made brooder will follow this article.

After each hatching of chicks the incubator should be carefully fumigated by burning a sulphur candle inside it for a few minutes. This will increase the percentage of chicks which successfully survive.

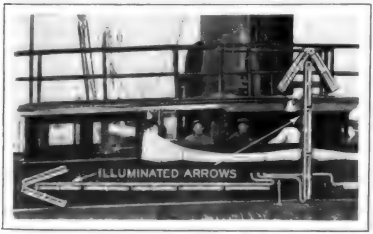
Students See Operation Through Periscope



The periscope prism device shown in the left picture "watches" an operation and reflects all details, enlarged three times, on a screen watched by students in an entirely separate observation room.

A LARGE body of students may now witness operations more clearly than ever without even being in the operating room. A new instrument introduced in France will do away with the crowds of students which ordinarily haunt operating rooms of big hospitals for the purpose of watching important surgical operations. The invention which is called the scialyscope consists of a periscope-like arrangement of prisms which transfers the picture of the operation on a screen in another room. The reflection of the operation is enlarged three times on the screen making it more clear for the students. The students, comfortably seated in an observation room, can follow every movement of the operating surgeon. They also hear his voice, in case he is lecturing on details of the operation. With this device surgeons are not hampered by crowding

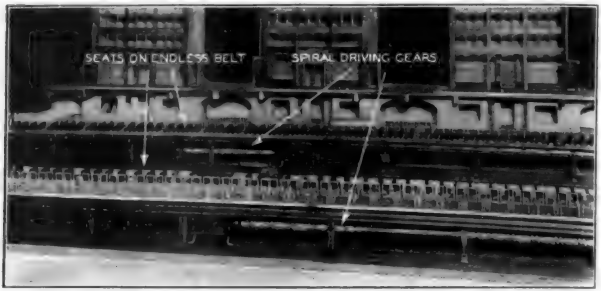
Electrically Illuminated Arrow to Avert Costly Collisions While at Sea



This photo shows "direction" arrows on the ship's bridge.

ELECTRICALLY controlled and illuminated arrows attached to the bridge of the *Batavia V*, a Dutch liner, indicate to other ships the direction being taken and reveals contemplated alteration of course. When the upright arrow is illuminated it means the vessel is continuing on its present course. When the left arrow is illuminated it signals a change of direction to the left. The lighting of its right arrow indicates change of course to the right.

ENDLESS Belt SUBWAY



This cross section drawing of model shows spiral driving gears and two-way line of subway seats.

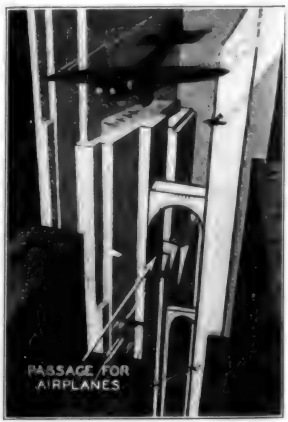
Amazing non-stop belt system would permit passengers to get on and off and take 70,000 past a given point every hour at moderate cost and, wonder of wonders, all travelers would be seated in future.

WITH giant skyscrapers being built in almost every large city of the nation and still larger and taller and greater ones projected for the future the traffic problem is growing daily more acute. Merchants and customers are wondering how they can get together without spending the major portion of their time in travel.

Out of this endless maze there has come the plans and the practical suggestions of Herman E. Taylor, supervisor of traffic for the Detroit Department of Street Railways, and because it seems practical and adaptable to all large cities it is being given serious study by city authorities, technical engineers and University authorities who have recently interested themselves in the national situation.

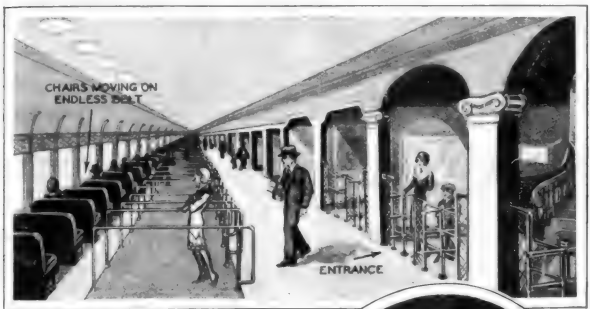
Mr. Taylor's method calls for a system of rapid transit, either subway or elevated, capable of carrying 70,000 persons past a given point every hour, every passenger seated and the system making no stops, but passengers permitted to board or alight at any point along the system with absolute safety!

Sounds fantastic, does it not? Especially when its sponsors insist that it will do twice as much as any two-track subway system,



Futuristic conception of city skyscrapers to facilitate the use of airplanes in traveling.

to EXPEDITE TRAFFIC



The girl above has stepped onto a slow moving outer "belt" which will speed up to same pace of belt carrying seats and permit her to sit down.

Herman E. Taylor, designer of "belt" subway.

and at one-half to three-fourths the cost.

A model of the proposed system has been completed and grinding out miles without a breakdown for many weeks.

The system is in the form of two endless belts, one immediately inside the other and each 5 feet wide, built in 12-foot sections. The inner belt, separated from the outer belt by an endless succession of automatically controlled gates, would move continuously at 20 to 25 miles an hour. Its outer edge would carry the seats, all facing in the forward direction, this belt known as the "constant speed platform."

Traveling on wheels and tracks, the 12-foot sections are built as solidly as the modern type street car floor and articulated at either end to fit the next section.

The outer "belt", or variable speed platform, is set off from the subwalk—in case the system is constructed underground—by another set of automatic gates. This platform would move at frequent intermissions at three-quarters of a mile an hour, at which times the gates would open to permit passengers to board from the subwalk. In nine seconds the variable speed platform would be accelerated to the same speed as the constant speed platform, permitting passengers to move through the inner gates, automatically opening for the purpose, and to take seats on the constant speed platform.

The entire system could be built only to move in one direction under the sidewalk on one side of the street and in the other direction under the sidewalk on the opposite side, Mr. Taylor says, a width of only 56 feet being necessary for turnings.

The system would be driven by electric motors, eight being required each side in each mile. Eight hundred horse-power per mile would start the lines, and 400 horse-power per mile would drive the system, Mr. Taylor says, as compared with four 50-horsepower motors now required as power for each two-car surface train.

A Puzzling Trick or Two for After Dinner Laughs

Top—The duplicate paper fits into a concealed pocket pasted to the sheet to be torn. Below—Due to the invisible celluloid disc, the water remains in the glass after the hand is removed.

GOOD tricks are an excellent means of entertainment; here are two that can be done anywhere. In the first take a glass of water and place the palm of the hand over it. The glass is inverted, the hand removed, yet the water remains in the tumbler. Much fun can be had by suggesting that others try it.

Beforehand, make a celluloid disc the size of the tumbler from a film negative, after removing the gelatine.

The disc is concealed in the palm, and fitted to the tumbler in the act of covering it with the hand. Inverted, the celluloid seals the water in the glass and the hand may be removed. The disc is invisible. At the conclusion reverse the process.

In the second trick tear a sheet from a newspaper. This in turn is torn several times. Rubbing them restores the complete sheet. Prepare two sheets of newspaper by making a pocket in the corner of each. In each place a similar size sheet folded small, as illustrated.

Tear the sheet, holding the pocket side in the back. Be careful not to tear the paper pocket. After the sheet is torn, the whole paper is slipped from the pocket and opened; in exhibiting the restored paper, the duplicate pieces are concealed behind the larger sheet.

Makes Better Pictures Possible

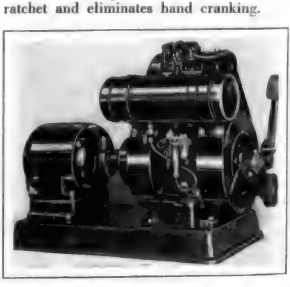
A MACHINE that exercises artistic judgment was displayed recently before the Master Photo Finishers of America.

This newest phenomenon looks through a photographic negative with an electric eye, and then stamps on the film the grade of paper the picture should be printed on, as well as the degree of light to be used.

The result of the invention, photo experts say, will be to improve the quality of pictures. The new machine, which is called a "printometer," was the idea of Roland J. Wilkinson, of Jackson, Mich.

Kick Starter for Small Engines

A KICK starter which requires only the pressure of the foot to start a small industrial engine has been introduced. The kick lever manipulates a roller chain and ratchet and eliminates hand cranking.



Here is a light engine equipped with kick starter.

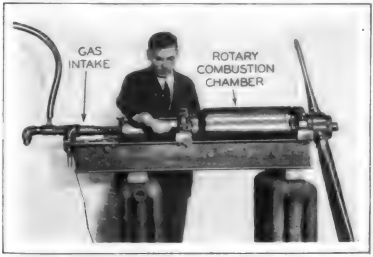
How Petrolastic Cement Joints Are Made Under Water

THE accompanying pictures show a system of joining vitrified pipe by means of petrolastic cement whereby a perfectly satisfactory joint can be made even when the pipe lies in several inches of water. This fact can provide a substantial saving of time and labor where a pipe line is to be laid in water, due to the fact that no sump digging or pumping is necessary.

When the horizontal joint must be laid under water, it is necessary to first give contact surfaces a light coat of hot petrolastic cement. This is done by simply mopping a small quantity of the hot material around the inside of the bell on one piece and the spigot end of the other section which make the joint. After this coat has cooled somewhat the pipe may be laid out in the bottom of the ditch and joined as though no water were present. When the pipe is centered in a horizontal position the oakum is packed into place. Then the rope runner is greased and pushed tightly against the ball. The petrolastic cement at 350 degrees F. is then poured in, the material forcing the water, in the annular space, out between the rope and bell. The material will still be hot enough after displacing the water to form a good adhesive bond to the paint coat which in turn is firmly attached to the pipe's surface. After cooling, the runner can be removed in the usual manner and the joint is complete without the formation of steam or any sputtering of material.

The section of 6-inch vitrified pipe which was poured under water was broken open to inspect the joint. Note complete displacement of water.

Recently Developed Gas Turbine Is Simplest Airplane Motor in World



Nicholas D. Belinski, of New York, with gas turbine consisting of a rotary combustion chamber with a six-foot propeller attached, claimed to be the world's simplest airplane motor.

A STEP forward in aeronautic progress being watched with considerable interest by aerial engineers is the development of a gas turbine recently announced by Nicholas D. Belinski, of New York.

This turbine, which consists of a rotary combustion chamber with a six-foot air propeller attached, is claimed by Mr. Belinski to be the simplest airplane motor in the world. The model makes about 800 revolutions a minute and was designed, according to Mr. Belinski, as a simple, light and safe aircraft engine.

BUNCOMBE Practiced

The hinged slate reveals sitter's question to the medium although sitter is unaware of the trickery.

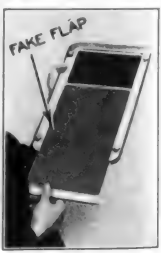
by **SAM BROWN**

ALTHOUGH they have duped thousands; although they are turning inside out the pockets of gullible believers; although some of their manifestations are unexplainable to the uninitiated—the fact still remains, stripped down to rock bottom—mediums are the bunk!

Let's look a bit behind the scenes. Here is the medium.

Slate writing is quite popular with these spirit-mongers. Another effect in this branch of the art is the Tri-Slate Message, as pictured herewith. In this number, the medium exhibits three large slates which are passed to the sitter for examination. The sitter is then requested to select one of them and on it write any question which he desires to be answered by the supposedly "sees all, knows all" spirits. After he has finished writing, he is requested to place his slate, face down, on the table. The medium then places the sitter's slate on top of one of the other slates, and then places the third slate in place on top of the pile. The three slates are then stood on end, and the medium's and the sitter's hands are placed over them, as shown.

And what happens! Nothing more nor less than this: The lowermost slate is cleverly hinged, so that by pressing a concealed button, the medium can release the flap. He does this immediately before lifting the slates to an erect position; and the result is that the writing on the sitter's slate can be read through the opening, as pictured. The slates are then returned to their original position, the faked slate clicks shut again, and the me-



The medium pulls a fake flap from the bolted slate.

by Mediums EXPOSED

Thousands have been duped by the tricks revealed here. Learn how the "spirits talk." Extremely simple methods are used on gullible victims.

dium is all set for as accurate an answer to the sitter's question as his mind is capable of.

So it goes. When working in a dark seance, the medium makes everything "free and above board" by using bolted slates. But—to what avail are bolted slates when one end can be slipped in and out, as shown in the photograph? The medium need only

The medium holds both hands up, fingers extended as shown, and tells subject to close her eyes.

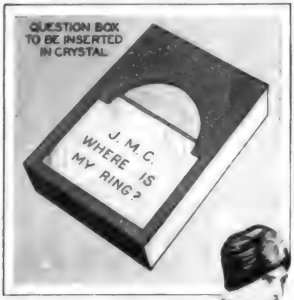
pull out the fake flap, write the spirit message, slip in the fake flap again, and then —Lights.

Of course, the performance takes on a more legitimate aspect if the medium's hands are held by the sitter or sitters during the course of the slate writing. This can be faked in any number of ways. One of the lesser known methods is the Ring Restraint. In this, the medium has two metal rings, each with a chain attached. He slips one hand into each ring, and allows a person on either side to hold the ends of the

His subject's eyes closed, the medium drops his left hand and presses two fingers of his right hand to her eyes. His left hand is free for trickery.

chains. Apparently everything is secure, but by slipping one hand free under cover of darkness, and holding both rings with one

Waxed Paper Pads Aid Mediums in Bewildering Unsuspecting Subjects



This small question box can be concealed in the hand. It is slipped to the medium who secretes it in his crystal. At the right a medium is gazing into the crystal but unknown to his audience the interior of the crystal contains questions written on the pad below.

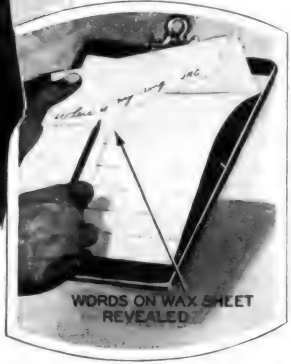
hand, the medium is at liberty to manipulate the slates or perform any other manifestation which he may have at his command.

Another and even more simple manner of releasing one hand is the Finger Method. In this effect, the medium holds his two hands up, forefingers extending, and with his hands in this position he requests the sitter to close her eyes and concentrate. She closes her eyes. He immediately drops his left hand, and, using the first and second fingers of the right hand, conveys the illusion of both hands being engaged in lightly pressing the sitter's eyelids.

One of the very first effects inaugurated by mediums, and one which is still highly popular, is the famous Billet Switch.

Time has improved the billet test, and elaborate methods are now in use in order to acquaint the medium with written questions set down by the subject. One of the best of these is the carbon impression table, as shown in the explanatory photograph. This table is covered with parchment or thin leather. Underneath the table covering is a sheet of sensitive carbon paper, and under this is a square of very fine white silk. The sitter writes his questions on his own paper, placing the paper anywhere on the table. And what happens? The questions are conveyed to the silk below, and by means of a hollow table leg, an assistant draws it downwards to a room below, as shown. After that, it is an easy matter to relay the questions to the medium by means of a headphone set concealed in his turban: and once in the possession of the vital facts . . . Well, does it need more explanation?

A phase of the medium's art which is particularly impressive is the materialization of spirits. Only those who have witnessed the effect can appreciate



Alternate sheets of this special pad used by mediums are waxed so pencil makes impressions of the questions asked by the sitter.

Trick Tables With Carbon Under Cover and Hollow Legs Are Used

In the billet test precautions are taken to acquaint the medium with questions written by the subject. The carbon impression table above is covered with parchment. Underneath is carbon paper and under that sheets of fine silk which are drawn down through a hollow table leg by an aid of the faker.

the real uncanniness of this performance. Imagine, if you can, a room, several persons seated about a table. The medium is one of this number, his hands held by the persons on either side, and their hands held by other sitters, and so on about the table. The room is dark.

The mechanics of the thing is absurdly simple. In an upper vest pocket of the medium's clothes reposes a hollow tube which closely resembles a fountain pen. In the inside of this is concealed a large rubber balloon with its mouth glued to one end of the fountain pen. The balloon is painted with luminous paint—the grinning face of the death-head.

Now, do you get it? With the room in utter darkness, the medium bends his head forward, gets the fountain pen between his teeth, blows it up. The death-head looms into view. It flickers for a bare second: then the air from the balloon is allowed to escape, and the fountain pen is once more reposing in the medium's pocket.

One of the simplest and most effective forms of billet reading is pictured herewith. In this, the medium uses a specially prepared pad, each sheet perforated into one-inch strips, and every other sheet of the pad being coated with a thin layer of wax. This wax is not visible, it cannot be felt, neither does anything written on the sheet above seem to make any impression on it . . . yet . . . when the pad is removed from the room and the medium's assistant sprinkles the waxed sheets with black powder, the written questions of the sitter's immediately become visible.

These questions are then copied off on small cards which are placed in a small box, as shown in the diagram. This box has two compartments, one to file the questions in, and another to receive the cards after they have been used. The first mentioned of these two has a small spring attached to the bottom which keeps the cards pressed flush against the top of the box.

Now for the effect. The assistant re-enters the seance room, carrying the question box concealed in his hand. He walks over to the medium's crystal, and secretly slips the box into a hollow recess in the back of the crystal which has been cut out for this purpose.

After that, the medium need only read the questions.

Carriage-Springs Add Kick to the "Ole Swimmin' Hole"

Discarded carriage springs aid divers, as shown, at San Pedro Park municipal swimming pool.

MUNICIPAL engineers of San Antonio, Texas, recently conceived the idea of utilizing a series of discarded carriage-springs to give an added "kick" to the springing-board at San Pedro Park municipal pool.

It is claimed that by means of the springs, which are full-elliptic type, that lumber has been conserved, while the diver gets the thrill of a higher flip into the deepest portion of the pool. The conservation of leverage in extending the board over the water, not only eliminates the replacement of boards which heretofore have broken in the diver's attempt to get height, but the artistic divers find that they are able to get the necessary clearance without the sacrifice of poise and grace.

Portland's Musical Air Mail Box

THIS giant air mail box, equipped with a loud speaker that broadcasts musical selections, was recently built at Portland, Oregon, to stimulate interest in the use of the air mails.

Although 13 feet high, as the girl on the step ladder shows, it follows the specifications of Uncle Sam's red, white and blue mail boxes. Even the lock is "regulation."

Novel method of telling the world about air mail.

Towing Engine Advertises Service

Model locomotive is wrecker and ad combined.

LIKE the old saw, "there are more ways than one of skinning a cat," there are thousands of ways in which business men advertise their wares or services by letting their business talk for itself.

Here is an example of how a western service station owner combines the utility of his tow car with an unusual, attention-compelling "traveling" advertisement. It is nothing more than a car with a "trick" body easily manufactured by anyone skilled in metal work. No motor changes are required unless greater realism is desired. The cost is not excessive for the amount of publicity that such a stunt is sure to arouse.

In this machine, power from the motor operates the derrick. The exhaust is run through the smoke stack and blows upward rather than out of the rear. An air whistle and railroad bell warn of its approach at crossings or in traffic. The headlights and lanterns on the side are detachable.

Pope Propels Miami Craft 40 Miles an Hour by Rockets

Here is Malcolm Pope—America's unlimited champion outboard racer—at the wheel of the Dixie Torpedo, with which he hopes to attain a speed of 100 miles an hour. He is testing the craft in Miami.

After several failures Pope sent his ship through the water at 40 miles an hour until his rudder broke.

WITH so much activity centered on harnessing rocket power to propel all manner of craft, the tests being conducted by Malcolm Pope, America's unlimited champion outboard racer, with the Dixie Rocket at Miami are interesting.

Mr. Pope has been working on his ideas for some time. During December he made his first attempts. They met with failure, however, due to improper wiring. In January he succeeded in getting up a speed of 40 miles an hour. Again, trouble stopped him for his rudder broke. Now he is engaged in setting up a "fool-proof" boat with which he hopes to whizz through the water at 100 miles an hour soon.

Although Mr. Pope has kept the plans of his torpedo-propelled craft secret, the ship will embody many of the ideas that have been tried here and in Europe. In place of the 22 rockets that were used to operate the ship in early experiments, there will be at least 36 or more. The charge of powder too, will be greatly increased to insure a greater propelling action behind the boat. The system of electrical timing of the discharge likewise will be simplified to assure the greatest possible speed from the power generated by these periodic explosions.

How rockets are placed is shown in this out of the water shot of the Dixie Torpedo. Note the smallness of the craft in relation to the men.

Unique Lighthouse Gas Station Is an Oregon Landmark

Here is the largest gasoline station in the country. It is 25 feet high and has a complete office in the lower half. A real lighthouse, it sends out powerful beams widely seen at night.

PORTLAND, Oregon, boasts the largest gasoline pumping station in the country. It is nearly 25 feet high and is a lighthouse in the truest sense of the word. The shining rays of the tower can be seen for miles up and down the road. The lower part of this unique station is used as an office and has ample room for all the equipment necessary to a successful business.

Use Electricity to Lure Wily Tuna

LANDING fish is real sport but when they weigh a hundred pounds or more, it is sometimes a problem. At least tuna fishers feel that way. With the assistance of engineers they now electrocute the fish once they are on the lines.

Since these men fish for profit and not the sport, an easy way to land fish was sought. A captain of one of the boats conceived the idea. And this is how it was accomplished. The boats are equipped with 110-volt direct current. On one side of the circuit is attached a small steel plate which is thrown into the water. The other side is carried to the steel hook through a small insulated wire. Once the fish is hooked a switch is closed sending sufficient current through the fish to stun it.

The same equipment has been tried out on large sword fish, weighing from 300 to 1,000 pounds which usually require seven or eight hours to land. By using electricity the same fish has been landed in approximately five minutes.

Mary Ann Jackson, Movie Mite, Likes Her Elephants Small, She Says

THEY come large and small, do elephants. But regardless of their size they must be fed, as little Mary Ann Jackson, youthful screen favorite ably demonstrates in the accompanying photograph. And, take the word of Mary Ann for it, her pet elephant is the smallest in the world. For that she is glad otherwise her little "baby" would have to wait until Mary Ann grew up a bit. He will only take his food and drink from his little mistress. Both Mary Ann and her pet are members of the Hollywood film colony.

GET READY TO RIDE AWAY!

SPRING is just around the corner. Budding branches will soon be waving to you — beckoning you out to the Open Road.

Ride away with the "early birds" this Spring. Get your Harley-Davidson now, so you both will be well acquainted and rarin' to go when the first whiff of Spring comes in from the country.

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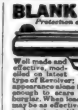

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JOHNSON SMITH & CO. Dept. 218 **Racine, Wis.**

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MAGIC GLASS. A glass filled with a piece of **water and when the water is poured out it is found to be wine.** THE MOUTH TRICK. Apparently a bottomless supply of colored paper ribbons comes out of your mouth. THE DISAPPEARING HANDKERCHIEF is placed in the hand mysteriously vanishes; the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE. One can but pretend to make a lady dance. THE MAGIC HAT AND DICE TRICK is large dice is placed on top of a hat, disappears, and is found in the hat. THE MYSTERIOUS BOX. Coin placed in box disappears. THE PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other tests and illusions are included, which you can make or procure at the necessary expense. **Price complete $1.00 postpaid. JOHNSON SMITH & CO.**

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"LOOK .... he's imitating a pianist!"

.....someone shouted Then a queer thing happened

JACK had strummed some "Blues" for us on his uke and Nan had just finished her screamingly funny burlesque on the "Kinkajou." We were all set for dancing when—the radio refused to work!

No amount of jiggling brought it to life, either. In spite of our best efforts, all we could get from that confounded radio was such desolate howls that the girls begged us to leave the poor old thing alone.

Someone made a half-hearted suggestion of bridge. But Tom had a better plan. Pulling Joe to his feet—good old "sit-in-the-corner" Joe, whom everyone liked to pick on—he cried in a loud voice:

"Just a minute, folks! The party is saved! Joe, here, has kindly offered to enliven the proceedings with a piano solo . . ."

Loud cheering drowned out the rest. This promised to be good—for, as we all knew, Joe couldn't play a note. Naturally we expected him to clown . . .

Just as he sat down at the piano, Tom called out:

"Play 'The Varsity Drag'—that's a hot dance number."

I couldn't help smiling at the thought of Joe—who had always taken a back seat at our parties — playing "hot" music. Excited whispers came from all parts of the room. "Wonder what he's going to do?" — "He doesn't know one note from another!" Suddenly someone shouted:

"Get this! Look — he's imitating a pianist!"

A Queer Thing Happens

Raising his hand tuxedramatically, Joe waited a moment to command silence.

Then, without any more preliminaries, and to the complete amazement of us all, he struck the first bars of — "The Varsity Drag!"

And how! With all the verve and expression of a professional! No wonder Tom's eyes almost popped out of his head! This wasn't the clowning he had expected Joe to do!

Unable to resist the tantalizing music, couple after couple glided around the floor. When Joe stopped playing, the applause could have been heard around the block—only to be instantly followed by requests for more numbers.

All evening they kept Joe busy at the piano—playing jazz, popular songs, sentimental ballads, even classical stuff—everything we could asked for, and they asked for plenty!

How that lad could play! I was dumbfounded. Why, it was incredible! Joe had always seemed to be a "born wallflower"—who had never displayed any talent for entertaining—yet now . . . I determined to solve the puzzle. On the way home that night I drew Joe aside and demanded:

"How on earth did you do it"

He laughed. "Why, it was very easy! I simply took that home-study course in music your cousin told us about . . .

"You don't mean that course that was supposed to show you how to play without a teacher, do you?" I interrupted.

"That's it! Say, it's a great course, all right!" he enthused. "There wasn't any expensive private teacher to pay—and since the lessons came by mail, I didn't have to set aside valuable hours for study. In fact, I practised only in my spare time, a few minutes a day. And the course is thorough! Why, almost before I knew it, I was playing simple pieces by note, and . . ."

"I guess you don't have to tell me how thorough it is," I broke in. "Your performance tonight was a knockout! And you used to say you had no 'talent'!"

"I haven't," he insisted. "Anybody can learn to play the U. S. School of Music way!"

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JUST how big a man are you? Not how big do you count yourself—but how do others size you up?

No use fooling yourself. The one measure is the dollar sign. It's the measure of a man in business, and many times outside of it.

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Changed Zero Rating Into Big Success

He stood in front of a bank in a southern town, when we first met him—just about as discouraged as a human being could be.

For one month—after giving up a routine position in a bank—he had been trying his hand at selling life insurance. Standing there in the rain, he was now trying to summon enough courage to ask for his old job back again!

"I can't talk with you about enrolling with LaSalle," said he; "I couldn't pay for the training if I took it."

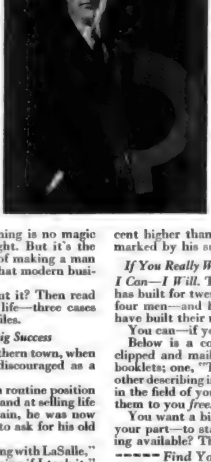
Nevertheless, he *did* talk with us—on our promise not to enroll him at that time, even if he asked us to. And later, of his own accord, he sent in his enrollment!

Result? Today—only six years later—he is area supervisor for a great insurance company—his territory embracing an entire state. During those five years he has increased his income approximately 500 percent—and in a recent letter he adds this line: "*Much of my success I attribute to the principles of salesmanship so ably presented by LaSalle Extension University.*"

He Turned a Laugh Into Envy

They laughed at him when he enrolled for training in Higher Accountancy—the other boys in the Indiana drug store where he worked as a prescription clerk. They kept on laughing as he studied in his spare hours that summer—they enjoyed themselves evenings while he worked.

But they didn't laugh ten months later, for at that time he secured a bookkeeping position at



a salary bigger than either he or they had ever received—nor did they laugh when he got his C. P. A. degree three years later and then went on to open his own public accounting office and earn five or six times what he had earned as a drug clerk.

Doubled His Income Rating

The third man was repairing air brakes in the car shops of a mid-western railroad—a fine, loyal worker, 36 years old—when he enrolled for Modern Foremanship five years ago. Eight months later, his measure under the dollar sign went up 28 percent and he was made Supply Foreman. It went up again and again as he became Chief Car Inspector—first at one point, then another and another—each job more important than the one before. Today he rates more than 100 percent higher than at the start and, better yet, he is marked by his superiors as a "comer."

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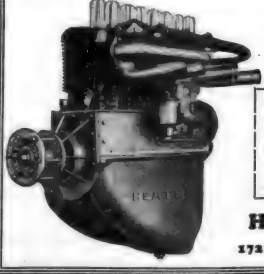

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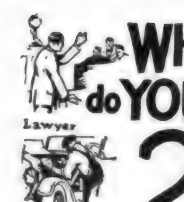

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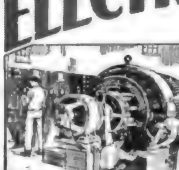

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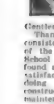

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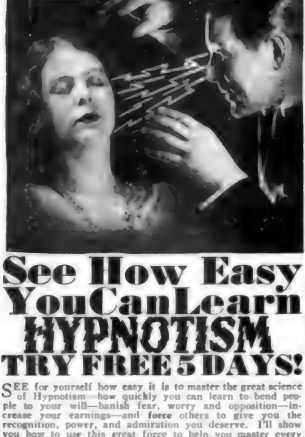

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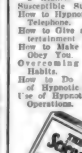

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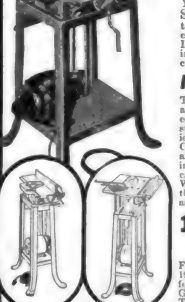

You will be delighted with the sturdy construction, splendid efficiency, and moderate cost of this Delta equipment. You will appreciate keenly in the "Handi-Shop" such exclusive constructional features as the Patented Tilting Tables, Automatically-Oiled Bronze Bearings, Heavy U-Shaped Lathe Bed, and Circular Saw Raising Lever. Full instructions and complete set of blue prints included. Send coupon for full details.

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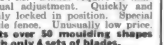
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Narrow Escapes in the Air

(Continued from page 88)

grease monkeys at a New Jersey flying field hold a plane while the motor was being warmed up.

Not hearing the call to clear the ship, he hung on. The ship gathered speed so fast he was afraid to let go. Hanging on he was waltzed skyward and flown to another field seven miles away. Neither the ship, the pilots nor Trask suffered the slightest injury.

A Northwest flyer named Ed Ballough, back in the old Jenny and barnstorming days, had two superstitions which nearly cost him his life. One was his refusal to wear goggles. The other was his antipathy to strapping on his safety belt.

One day he stalled at the top of a loop, and things happened quickly. First, he started to fall out, and in clinging to the stick, he pulled it from the socket. As soon as he realized that the stick was on its way earthward, Ballough let it go, and managed to grab his belt and make fast. Meanwhile the ship flew out of the loop upside down, banging along great guns.

Reaching backwards, Ballough tried to right the ship by turning the control horns with his bare hands. The leverage was insufficient.

Gliding upside down toward the field under him, planning an upside down landing, Ballough had the ill luck to crash in his right wing against a telephone pole.

Men on the field saw the pilot of the ship race for a car, and having arrived after Ballough took the air, they did not know who was flying. No one knew who the man was, or where he had disappeared to. Later in the day Ballough came back. He had injured his arm, raced for his car, and departed for medical treatment! Nutty? Yes, but true.

Here's another; tie this one if you can!

One of MODERN MECHANICS readers, James Hendrickson, Havre, Montana, built himself a natty little Super Parasol. He took it out on the flat rolling prairies where once cattle were wont to graze, faced it into the wind, and tried to start her little motor. No luck.

Now it is queer that nobody who hasn't seen the Heath motor run seems to have little respect for it. It is so small and so simple looking, everyone expects it to purr

(Continued on page 190)

Bebe Daniels' Vivid Life Story!

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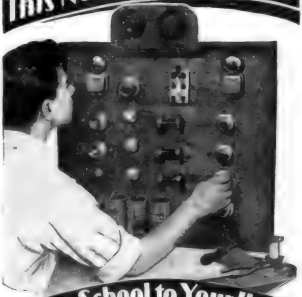

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Narrow Escapes in the Air

(Continued from page 188)

like a contented cat and to barely have enough power to lift the Parasol aloft.

The motor is cranked by standing behind the prop, neck to the leading edge of the wing. A few quick bats at the little stick, and the motor usually catches on with a roar that scares everybody.

Innocent of what waited in store for him, and doubtless a little contemptuous of the wallop these little cast iron dynamite packages carry, Hendrickson cranked away. Finally he set the choke back and gave full throttle, thinking to clear the motor which he thought flooded. The next flop of the prop and the engine took hold, full out, bowling him over.

The plane flew away. The little ship made a pretty, pilotless flight of five miles, landing out on the prairie five miles away when the constant gunning overheated it sufficiently to slow the motor up.

No less thrilling to the pilot who suffered the adventure is the escapade of Lieut. Jerome, U. S. Marines. Lieut. Jerome recently was flying a high powered pursuit plane over San Diego, giving an exhibition of acrobatics fit to make the blood tingle.

These high powered heavy ships, of tremendous speed, must be flown with two hands, and it takes beef to do it at that. They have to be "flown in" even in landing.

This made it doubly alarming to Lieut. Jerome when at the finish of a tight right snap roll his control stick was jerked in two. Frantically kicking the ship into a dizzy spiral by ruddering, he tore off his safety belt, his necktie, his socks and his suit belt, seeking to tie the defunct stick alongside its broken stub. All the while the ship was losing altitude like a rock and was now perilously close to earth.

Finally the repair was effected, having taken but little longer than it takes you to read about it. Gingerly testing out the stick, Jerome found he had enough control over the ship to make a landing safely, which he finally effected.

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Speedway Racers for Everybody

(Continued from page 57)

ing speed. At a mile a minute it will run better and easier than most cars do at thirty.

Another factor in surplus speed is easy get-away in traffic. If you have a top speed of ninety in second gear you can jump a block ahead of all the other cars when you leave a traffic light.

Speed in my own car is not so much a matter of engine power as it is the coordination of design which we learned in building racers. Few drivers realize what a change of a few pounds in weight may do to car performance. For example, I am planning now to reduce the weight of our wheel hubs by about six pounds per wheel. The hubs are perhaps eight or nine inches in diameter, located largely outside of the tire center, and perfectly balanced about the axle. At first glance the layman would say a change of six pounds in perfectly balanced weight could not appreciably affect the car performance, but there's where the layman would be wrong, as we learned on the speedways.

Let me tell you of the experience of one of our car owners. We use a heavy six ply tire as standard equipment. This gentleman, a wealthy New Yorker, visioned what might happen if a tire failed at ninety miles an hour, and asked for an extra heavy eight ply tire, which weighs about twenty pounds more to the wheel. We strongly urged against it, and told him he would encounter trouble at high speed, but he insisted on having his way.

Well, one day a car passed him, going about 82. He let it get a nice lead, and then stepped on the gas. At around 90 or 92 the whole front end of his car developed a terrific shimmy, and it didn't disappear until he had slowed down to around 70. He stopped, got out and inspected the front end, but could find nothing wrong. Having more than the usual curiosity about things mechanical, he made two or three other trials, and each time at the same place the shimmy developed, so he drove back to the factory.

We reminded him of our prediction, and changed to a standard set of tires, then drove him out to the speedway and tested the car to well above a hundred miles an hour without a sign of vibration.

by **FRED S. DUESENBERG**

With the fast cars being built today it is best to stick to the standard equipment specified by the manufacturer. You wouldn't think of buying a fine watch and then taking it to a jeweler to have a heavier main spring installed in an effort to improve its operation. Well, fine cars are just as critically balanced as a fine watch.

Balance and weight is one subject we plumbed to the bottom when building racing cars. Our little 91 cubic inch Duesenbergs weighed 1435 pounds. I was largely instrumental in getting a weight factor added to the engine capacity rating. As it stands now a weight of seven and a half pounds per cubic inch of engine capacity will be required at Indianapolis on a basis of 233 cubic inches minimum, which will make the minimum car weight 1750 pounds. Actually this year's cars will have 366 cubic inches, so the minimum weight will still be below the table requirement.

Weight Distribution Important

Somebody asked me the other day why we couldn't put cylinder liners in the 420 cubic inch pleasure car engine and rebuild our little 91 inch jobs to enter this year's race at 366 cubic inches. The answer is that all weight distribution would be completely upset. The chassis would be too light, the engine too heavy, and the car as a whole would not only be a complete failure, but exceedingly dangerous.

I've been in the speed game for thirty-one years, starting as a bicycle racer. Getting into the gasoline field was the result of building motorcycle engines to produce a gasoline cycle to pace bicycle racers. From that to racing automobiles was only a step, and from racers to pleasure cars the natural course.

Curiously enough Harry Miller and I, after tangling more than any two race builders in recent years, are now in a way associated, for the Duesenberg company is associated with the Auburn group, which includes the Cord car, with Harry Miller's front wheel drive, also a race track product. Thus both of us are using speedway experience to improve the pleasure car markets. Horsemen have always claimed that racing should be supported to improve the breed of horses, so why shouldn't automobile racing be supported to improve the breed of automobiles?

The only man who could talk to the Superintendent

"Soon after I began studying," a student wrote to us the other day, "we had a change in management at our plant. I certainly was glad then that I had decided to study in my spare time. For, thanks to my I. C. S. course, I was the only man in the organization who could talk to the Superintendent in his own language. As a result, I was promoted over men who had been here from ten to twenty years. My salary has been increased 90% in the last ten months."

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2. After the ship is rolled out of the hangar what is the first thing a good pilot should do? (See page 80)

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The Lawrence Water Glider

(Continued from page 124)

and is glued and wrapped with thread every four inches.

The ailerons are made the same as the wings. The wing tip is the next.

A piece of straight grained oak or ash approximately ten feet long, one-half-inch thick by one and one-eighth inches at the entering edge gradually tapering to one-half by one-half at the trailing edge and to be rounded on the outside and must fair up with the entering and trailing edges, fasten the ends of the tip to the entering and trailing edges with small screws and wrap with one-half-inch strips of fabric and dope heavy. Put the copper strip from spar end around this strip to the spar again and nail with small brass nails.

Details of the Spars

Put the fittings on the spars to receive the struts and control pulleys as shown in the drawing. The lower wing is made the same way as the upper wing except it is straight on the bottom and is made in right and left halves. Let the spars stick out past the No. 1 rib at least two and one-half inches. That is to take care of the bevels fore and aft and the five degree dihedral which the lower wing has, also to give room for the spar fittings which are bolted to the spar with three three-sixteenths bolts and to the side of the pontoon with five No. 9 three-quarter round head brass screws.

The outer ends of the spars on both wings must be tapered from the last rib down to the size of the wing tip strip, so as not to interfere with the fabric when it is put on. The fabric is unbleached muslin of a very good grade eighty-one inches wide. Two of these pieces twenty-eight feet long must be sewn together with a seam one and one-half inches and this seam is put over the entering edge and tacked temporarily every five inches and then the fabric is pulled back to the trailing edge and tacked opposite the tacks on the entering edge. It does not make any difference whether you cover the top or bottom first.

After getting the top and bottom pulled taut pull the fabric taut from the wing tips and tack temporarily. Now trim off all surplus leaving enough to turn under when you sew the fabric together. Starting at the wing tip at the nose the fabric must be sewn

(Continued on page 196)

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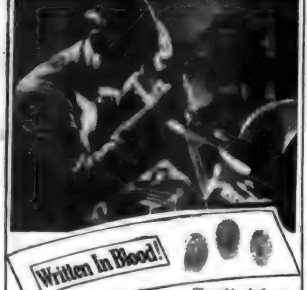

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The Lawrence Water Glider

(Continued from page 194)

together neatly around the tip, and the section where the aileron goes can be tacked every three or four inches with small copper tacks. Continue sewing until the entering edge is reached again. After getting the fabric on taut and smooth you are ready to sew it to the ribs.

First tear some strips about one and one-quarter of an inch wide and a little over six feet long and take the threads out of each side of these strips for about three-sixteenths of an inch and stick them tight and smooth over each rib with one coat of dope, then when that is dry you are ready to sew the fabric through this strip to the rib with a long needle. (I made mine out of a bicycle spoke.)

Stand the wing on the trailing edge and one person on each side of the wing starting at the top between the spars run the needle with about ten feet of shoemaker's thread doubled through square with the rib, and the fellow on the other side sticks it back square with the other line of thread, then tie these four threads tightly together with a square knot.

Then come down the rib four inches and repeat. Do not cut the thread; tie tight small knots that won't slip. Continue this to the trailing edge on all ribs; the small wings likewise.

Applying the Pinked-Edge Tape

When the sewing is completed the pinked edge tape is put on by brushing the dope on over the ribs and laying the tape down in this dope before it sets, giving the tape a heavy coat immediately. Smooth the tape out neatly with the fingers. Then apply one coat of nitrate wing dope to the wing. Do not brush in too heavily because the dope will go through the fabric and hang on the under side and will waste what is rather expensive stuff.

That will tighten the fabric considerably. Allow it to dry three hours at least before applying the next coat. Three coats is sufficient for the top wing but give the lower wings four or five as they will be wet quite a bit. Put a little aluminum powder in the dope if you want silver wings. About a pound of powder should do the job. It requires about fifteen gallons of dope. Fol-

(Continued on page 198)

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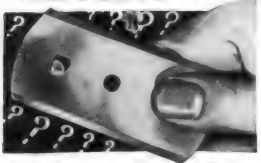

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The Lawrence Water Glider

(Continued from page 196)

low the same procedure in covering the tail surface.

The struts are to be made now—four main pontoon struts, two front and two rear, and four smaller struts, two at each end of small wing. The large front struts are three and five-sixteenths inches wide by seven-eighths thick by three feet and five inches long. The two rear struts are the same dimensions and three feet long. The front outer strut is two and one quarter by thirteen-sixteenths by thirty-two and one-half inches long. Two struts of these dimensions and two struts two and one quarter by thirteen-sixteenths by thirty-four and one quarter inches long. Give the struts two coats of spar varnish.

The upper and lower booms that carry the tail are of the very best straight grained spruce, and the upper one at the forward end is one and one-eighth inch by two inches and at the stern post is one inch by one and three-quarters inches. The sleeve fitting on the forward end is made out of a piece of one and one-eighth inches steel tubing, No. 18 gauge, six inches long, flattened on one end for two inches.

The Bottom Boom

This is drilled to slip over the five-sixteenths steel bolt on the top of the rear spar. The bottom boom is one and one-eighth inches by two inches at the forward end and one inch by one and one-half inch at the stern post.

The stern post being only three-quarters of an inch, the booms must be faired to permit the gussets to fit snugly. The vertical struts are the same thickness as the booms at their respective stations and are streamlined between gussets.

The bottom boom has a fitting the same as the top except it is bent to fit against the transom of the pontoon. A one-eighth copper nail is used as a rivet through these two fittings to keep the booms from pulling out. The vertical struts are fastened to the booms by gussets, No. 16 gauge aluminum being used for this, using No. 4 five-eighths-inch brass screws. Use filler block to fill out space between gussets as there is one on each side of strut and that gives a good fastening for the brace wire clips, also using two clips made of No. 16 gauge steel

(Continued on page 200)

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3. What system of engine cooling do you think best for planes? (See page 80)

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The Lawrence Water Glider

(Continued from page 198)

with a three-sixteenth bolt through both gussets and block and the two clips coming together where the brace wire turnbuckle and thimbles come.

Use three-thirty-second stay cable for this bracing.

The thimbles are put in the end of the cables by wrapping the cable around the thimble and clamping it with a pair of pliers. While you wrap the short end tight against the long part of the cable with No. 20 copper wire wrap this connection for about two inches leaving gaps of about one-quarter-inch in between. Cut the end of the short side of cable off on a long bevel with a pair of nippers so as to make a neat job. Then solder and wipe the solder with a rag before it sets. That insures a clear smooth job. All cable ends and brace wires are made in this way. Get the length of the brace wire or control cable, leaving the turnbuckle well unscrewed. Just so you can see the threads in the barrel of the turnbuckle, and then pull the wire tight and proceed to fasten it.

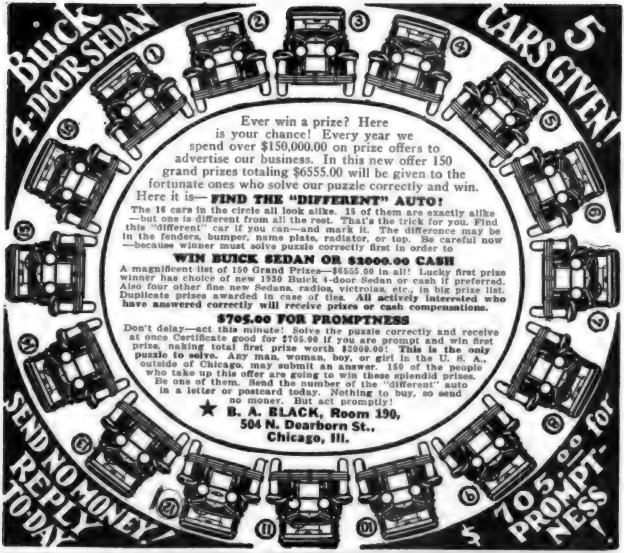
The Tail Group

Now we are back to the tail group which is very simple. The details given on the detail page are so plain there need not be much said about this. The entering edge of the stabilizer is elevated one and three-eighths inches by a little aluminum clip. On either side of the top boom and a small bolt through the clip and stabilizer.

There are two braces also fasten onto the entering edge and to the vertical strut which comes directly under the entering edge. The two struts that come on the stabilizer are fastened at the bottom of the stern post on the lower end and to the stabilizer spar on the upper end. These brace struts are three-eighths-inch No. 20 gauge seamless steel tubing twenty-six inches long, flattened two inches on each end and bent to the desired angle.

Flatten and bend them while at a cherry red heat, in a vise. It is not necessary to reinforce the ends of these small brace struts. The rudder and flaps are made as easily as the stabilizer. The control horns for the flaps are made and put on before the flaps are covered, with one one-quarter-inch bolt tightly drawn up and riveted

(Continued on page 202)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The 16 cars in the circle all look alike. 15 of them are exactly alike—but one is different from all the rest. That's the trick for you. Find this "different" car if you can—and mark it. The difference may be in the fenders, bumper, name plate, radiator, or top. Be careful now—because winner must solve puzzle correctly first in order to

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Dear Mr. Lamon: Send me your FREE Book, "*How to Raise Poultry for Profit.*" I want to know more about my opportunity to make $2,000 to $5,000 a year, spare or full time.

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The Lawrence Water Glider

(Continued from page 200)

lightly. The brace wires on top and bottom keep the horn from moving, there being two brace wires to each corner of the flap to the top of the control horn, also on the bottom.

The rudder has one control horn No. 14 gauge aluminum at the bottom; it is screwed onto the rudder with six one and one-quarter No. 5 screws R.H., and a No. 20 piano wire brace goes from the end of the control horn to the extreme end of the rudder at the bottom. There is also a similar horn and brace wire at the top of the rudder.

It would be advisable to completely assemble the plane before covering any of the surfaces because there might be some minor adjustments or changes you would prefer to make. Get the pontoon on a pair of steady horses and lay a two-foot level fore and aft on the straight part of the pontoon and get it level fore and aft. Then across the pontoon. Now put the two front struts in place by using bolts through the struts and screws into the block.

Fastening the Wing

After getting the four struts on and having made the cross brace wires with turnbuckles on them you are ready to lift the large wing onto them and fasten it, and true up the four struts with the cross brace wires.

Take the small wing on either side and fasten it to the pontoon by means of the spar fitting as shown in the detail. Fasten this fitting with screws to the pontoon and three three-sixteenths bolts to the spar.

After getting this done the two small struts come next. Secure them to the bottom and top spar fittings. Then tighten the cross brace wires between the two struts enough to steady it. Then make up the flying and landing wires and cross brace wires and leave the turnbuckles well out on these wires for truing up. The flying wires will not be quite as tight as the landing wires. Be sure the lower wing edges are in line with the top wing (parallel).

The entering edge of the lower wing comes about eleven inches back of the entering edge of the top wing. This is located by two plumb bobs suspended from the top wing and measuring back eleven inches.

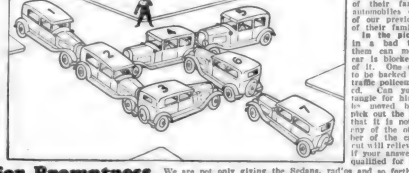
Continued on page 204)

Win Nash and $500 or $1,845 Cash

Seven Brand New 6-Cylinder Cars Given

For advertising purposes I am going to give absolutely free a brand new six-cylinder "Special Six" Nash four-door Sedan, an Oldsmobile two-door Sedan, a De Soto two-door Sedan, a Pontiac two-door Sedan, an Essex two-door Sedan, a Whippet two-door Sedan, and a Chevrolet two-door Sedan, all six-cylinder latest model Sedans; also 4 splendid new console type radios, a Victor Orthophonic Victrola and other valuable prizes. Any person living in the United States outside of Chicago may enter an answer to this puzzle except employees of the W. D. Boyce Company or members of their families, or winners of automobiles or first prizes in any of our previous offers, or members of their families.

Solve This Traffic Puzzle



In the picture there are 7 cars in a bad traffic jam. None of them can move forward, for each car is blocked by the one in front of it. One of these cars will have to be backed out. Which one? The traffic policeman seems to be puzzled. Can you straighten up this tangle for him? Only one car may be moved backward, and if you pick out the right one, you will see that it is not necessary to back up any of the others. Send the number of the car which when backed out will relieve this traffic tie-up, and if your answer is correct you will be qualified for this opportunity.

$500.00 for Promptness We are not only giving the Sedans, radios and so forth in our big prize list amounting to over $6,000.00, but are also giving an additional $500.00 in cash for promptness to the winner of first prize if he or she has been prompt. Thus, the first prize winner will receive the Nash Sedan and $500.00 in cash, or $1,845.00. Find the car which when backed out will relieve this traffic tangle and send the number of it in a letter or on a post card, or you can write the car on the picture and send it to me. Be sure to write or print your name and address plainly. All who answer correctly can share in the prizes or cash. Duplicate prizes paid in case of ties. ANSWER TODAY. **Free Prize Judge, Dept. 584, 510 N. Dearborn St., Chicago, Ill.**

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Mower slips into sharpener without being dismantled.

THIS MAN IS MAKING $4.00 to $6.00 an hour!

SHARPENING LAWNMOWERS in Spare Time With the "IDEAL" LAWNMOWER SHARPENER

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Use Your Spare Time. If you work at a trade, put an Ideal in your basement and earn $4 to $6 an hour evenings and Saturday afternoons. E. W. McCormick, Saginaw, Mich., writes: "Five years ago I bought an Ideal Sharpener on which I have ground over 2,000 lawnmowers. In the last few weeks I worked at my trade, machinist, full time 9 hours a day. I also ground 97 mowers which netted me $114.10 clear gain."

Pays for itself and makes big profits: C. S. Coburn, Little Rock, Ark., writes that his "Ideal" Sharpener earned enough in 18 months to pay for itself and $1857.00 worth of additional machinery.

Our Free Book Tells You How— these men and many others have made themselves independent—built substantial, permanent, BIG PAYING businesses with this Ideal Sharpener. Send for this book today—it's free.

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THE "IDEAL" LAWNMOWER SHARPENER is a wonderfully simple machine that sharpens all makes of mowers perfectly, scientifically, without taking the mowers apart. Just pick up the mower, set it in the "Ideal," make a few simple adjustments and proceed to sharpen. In 15 minutes the mower is ready for the lawn, and you have made $1.50 to $2.00—depending upon the charge you fix. No training required, and machine set up in a few minutes. Plug into light socket and start to sharpen. Hundreds of dull mowers in your locality are waiting to be sharpened. Owners are looking for a place to get them sharpened. Sharpens skates—all kinds—perfectly.

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Make big money in this easy and pleasant work. Big demand for trained operators. Write for details.
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62 Sprout Street Detroit, Michigan

The Lawrence Water Glider

(Continued from page 202)

Be sure the wings line up and the two lower wings have the same degree of attack. If it does not it will cause her to handle badly and may not fly at all. Now fasten the booms for the tail group on and take care to keep the stabilizer and the stern post plumb as this will cause grief if you don't.

There are four brace wires, two on each side of the stern post, one at the top of the stern post and one at the bottom. The top wire leads to a fitting on top of the rear spar approximately five feet from the center rib and the lower wire leads to the bottom fitting at the rear outer strut. These wires are the ones by which you true up the tail group after getting the stern post plumb. There are four small three-eighths No. 20 gauge seamless tube braces two on each side underneath the stabilizer; one fastens to the entering edge and one to the main spar of the stabilizer. This brace fastens at the bottom to the stern post, and the one under the entering edge fastens to the vertical strut that comes directly under the entering edge.

Elevator Hinges

The hinges for the elevators are made by taking three-eighths-inch bolts two and one-half inches long and cutting off the head and cutting halfway through the bolt three-eighths of an inch from the end, sawing this piece out.

Be sure to get the exact center when making this cut because when you put the two halves of the hinges together they should fit snug and the ends of the two halves should be round.

The rudder hinges can be made the same way or taking a piece of No. 20 gauge steel three by four inches and bending it across the three-inch way to fit the stern post. Braze two pieces of three-sixteenth-inch tubing one inch long, one at each end of the hinges. The half on the rudder is made the same except only one piece of tubing is brazed on this to fit between two pieces on the stern post half, and the size of this sheet before bending is two inches by four inches.

Use a piece of three-sixteenth rod for pins with a cotter pin hole at top and bottom. Fasten these hinges to stern post and rudder with two three-sixteenth bolts to each half of hinge.

(Continued on page 206)

Win $3,500.00

Prizes from $1800.00 to $4295.00 each have been won through our unique advertising plan. In our last, an old man of 69, out of work, won over $5000.00. A boy, only 15, won $900.00. In next 3 or 4 months thousands of dollars will be awarded to fortunate persons who solve our puzzles and win our prizes.

FIND THE TWIN FLYERS

Watch out! These twelve pictures of a famous woman flyer all look alike—BUT—two, and only two, are exactly alike. **Find these twin flyers!** Some pictures are different in the collar, helmet, goggles, or tie. Remember, only two of the twelve are exactly alike. Find them, and send the numbers of the twin flyers on a post card or letter today. If correct, your answer will qualify you for this opportunity.

$7150.00 IN PRIZES GIVEN THIS TIME

Over 25 prizes, and duplicate prizes in case of ties. It's up to the winner whether he or she chooses $2875.00 in cash or a new Waco airplane, a big automobile, or a new home. A gorgeous prize list! ANYONE WHO ANSWERS THIS PUZZLE CORRECTLY MAY RECEIVE PRIZES OR CASH.

$625.00 ADDITIONAL FOR PROMPTNESS

Be prompt! It pays. Find the real twin flyers, and I will send Certificate which will be good for $625.00 if you are prompt and win first prize. Duplicate, a first prize of $500.00, if tie occurs. NO MORE PUZZLES TO SOLVE. Any man, woman, boy, or girl in the U. S. A. —except at all, except residents of Chicago, Illinois, and former major prize winners. 25 of the people who take up this offer are going to win these won...ful prizes. Be one of them. Send the numbers of the twin flyers. Send no money, but be prompt.

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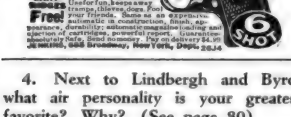

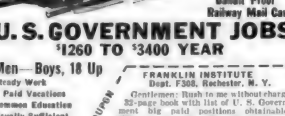

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"We can't get married until—"

"We can't get married until I earn more money." Thousands of young men are saying that today. Thousands of girls are giving that as the reason the marriage date is being put off and off. Sometimes it gets a little embarrassing, too, to have to keep on giving that reason. *For we girl likes to admit that the man she is going to marry is a failure!*

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If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

The Lawrence Water Glider

(Continued from page 204)

Tighten up the nuts and brad them. The control cables to the top elevator horn go through the stabilizer as you will see by looking at the drawing of the tail group.

All cables are fastened to the control horn by a small clip five-eighths by three-inch No. 18 gauge bent around the horn tip with a three-sixteenth hole through the fitting and tip. The brace wires pass through this hole and fastened. This answers two purposes. It makes an anchorage for the brace wires and they in turn form a safety wire.

The small wing pontoons are twenty-seven inches long by seven and one-quarter inches wide by six inches deep, the curve on either end is a two-foot radius, there being a solid nose piece at each end.

This piece is rounded as shown in the detail and is fastened between the two sides just as the spreaders are.

Give these pontoons four coats of dope after covering with fabric. They are fastened to the wing spars by a long fitting seventeen and one-quarter inches long by seven-eighths inches wide, No. 16 gauge steel.

Put four No. 6 three-quarters R.H. brass screws into the pontoon and two at each end of the fitting into the spar. After getting her all completed give her a minute inspection. There must be a reel made to wind the three-thirty-second-inch tow cable on. This reel must have a crank about eight or nine inches long and is mounted on the stern of the speed boat that will make thirty to thirty-five miles per hour. Using a cable from four to six hundred feet long some good altitude can be had. For the first time out do not try to get her off. Feel her out and get used to the controls before trying to pull her off. Takeoffs must be made directly into the wind.

These plans are just a little different than the original in that I have put two main booms instead of the four small ones to the tail unit.

Where is Radio Going?

(Continued from page 71)

type detector instead of the grid leak type, which is another step in the direction of good quality. Both these features were the dream of set designers three years ago, and now they are accomplished facts.

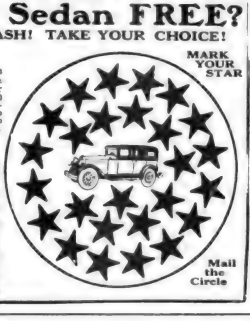
(Continued on page 208)

Who Wants a Sedan FREE?

STUDEBAKER—BUICK—NASH! TAKE YOUR CHOICE!

or $2000.00 Cash

Thousands of dollars in new autos and grand prizes will positively be given free to advertise and make new friends for my firm. Choice of Studebaker or Buick or Nash new 5-door sedan delivered free, or $2000.00 cash. Also Oldsmobile, Pontiac, Chevrolet, Fords, diamonds, other fine prizes and cash will be given free. No problems to do. No fine writing required. No words to make. No figures to add. Bank guarantee all prizes.



PICK YOUR LUCKY STAR!

All the stars in the circle are exactly alike except one. That star is different to all the others and it may be a lucky star for you. Can you pick it out? If you can, mark the different star and send the circle to me at once, along with your name and address. A prompt answer can start you on the way to win the great $2000.00 first prize.

BE PROMPT—WIN $650.00 EXTRA

Someone like you who will write me at once can get $650.00 cash just for being prompt, so you may thank your lucky stars if you send your answer right off. No risk. Nothing to buy. Nothing hard to do. Over $7000.00 in valuable prizes will be given free of cost. Send today and I will show you just how you can get your free choice of these splendid new sedans or $2000.00 cash, without cost or obligation of any kind. All win plan! A reward for everybody. SEND NO MONEY. Answer AT ONCE.

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5. What plane recently won the Guggenheim safety award? (See page 80)

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WHEN—

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The unsightly, unnatural protrusion disappears, and—

You recover your vim, vigor and vitality,—your strength and energy,—and you look and feel better in every way,—and your friends notice the difference,—

THEN—

You'll know your rupture is gone, and

You'll know why for almost a quarter of a century numerous sworn statements report complete recovery and freedom from uncomfortable mechanical supports, without delay from work.

SEND NO MONEY

A test of the scientific self-treatment mentioned in coupon below is now available to you, whether you are young or old—man or woman. It costs you nothing to make this test.—For your own good mail the coupon NOW—TODAY.

FREE TEST COUPON

PLAPAO LABORATORIES, Inc.
450 Stuart Bldg., St. Louis, Mo.

Send me a Free 10 day test supply of the remedial factor Plapao and 48-page illustrated book on Rupture; no charge for this now or later.

Name .....

Address .....

34 Lesson Drawing Course $2.98

The biggest value you ever saw advertised anywhere - - - - - - -

Haven't you often wished that you could draw cartoons, illustrate some idea, sketch some pretty face, etc.? You can do all of these things. One of America's most famous Cartoonists and illustrators has developed a great, simple system for success in all branches of Commercial Art. This system has revolutionized the entire theory of drawing. It means that drawing can be as easy for you as writing—much simpler than learning shorthand, bookkeeping or typewriting. We are now placing this original system for learning Drawing, Art and Cartooning, consisting of 34 lessons with over 500 illustrations, within reach of every one. If you will devote a few hours each week to the Course WE ABSOLUTELY GUARANTEE that you will learn to draw and draw well before you have half finished the Course. If we fail to make this claim good, we will refund every cent paid us. By eliminating a large office force for answering correspondence, expensive catalogs, etc., we are enabled to make a price of $2.98, the cheapest price ever known for a high-grade, home study course. Learn to draw. It is a big asset, no matter what field you are in.

SEND NO MONEY

Just order the course and on arrival pay postman **$2.98** plus a few cents postage, payment in full for the entire Course and Drawing Outfit. If not entirely satisfied, return within five days and we will Refund Money. Address:

LEDERER SCHOOL of DRAWING,
Dept. 436-F Chattanooga, Tenn.
Orders from outside the U. S. A. are payable $3.23 cash with order.

If you order the Course at once, we will include a drawing outfit, consisting of artists' pencils, pens, paper, erasers, thumb tacks, etc., enabling you to go to work without any additional cost.

6. What induced you to enter this contest? (See page 80)

FUEL COSTS SMASHED

OIL HEAT Now At A FRACTION of PRESENT COSTS!

SENSATIONAL DISCOVERY!
At last the oil burner industry's greatest problem is SOLVED! Waste of oil is eliminated! The INDESTRUCTIBLE Mineral Wick, exclusive feature of the Laco only Wick Type Burner on the market, does it! Now LOW OPERATION COST is combined with LOW INITIAL COST!

Oil heat revolutionized by amazing invention—BURNS AIR and OIL—cuts fuel costs, eliminates waste, dirt, smoke, grease. Costs so little the smallest home can easily afford it.

YOU CAN INSTALL IT NOW WITHOUT LOSS OF HEATING TIME

A few minutes' easy work and it's ready to heat. Save money by getting your oil burner now—3 months bad weather coming—keep your home comfortable with oil heat at amazing low cost.

FITS ANY FURNACE OR STOVE

There is a Laco for every kind of coal stove or range—and for any kind of furnace—hot air, hot water, steam or vapor heat, etc. Fully automatic—THERMOSTAT HEAT CONTROL. Operates quietly. Complies with all ordinances. Safe as the ordinary kitchen range. GUARANTEED.

EASY TERMS

Write now for full information. Tell type of heating system or stove you now have—mention whether you have electricity. SPECIAL INTRODUCTORY LOW PRICES OFFER if you write now.

DEALER—SALESMEN WANTED
The Laco has jumped from 68th to 9th place in U. S. sales **almost over - night!** To the man who will invest a small capital in demonstrators, then get out and SELL, we offer an opportunity **big enough for ANY man.** Write us **now.**

LACO OIL BURNER COMPANY
2008 Union Street, Griswold, Iowa

Where is Radio Going?

(Continued from page 206)

Because the tube itself gives such great amplification it is not necessary to use such high ratios in the radio frequency transformers. This makes possible the use of transformers that give practically uniform gain and uniform selectivity over the whole broadcast range. Thus, while last year's sets were quite sensitive in the middle of the dial and weak at both ends, the new screen grid receivers are sensitive and selective over the entire dial range.

The radio frequency transformers for the three element tubes had to have three windings, the extra one for balancing the feedback capacity, and with it was associated the troublesome balancing condenser. All these parts are gone in the new receivers, and with them went the losses and the troubles they involved.

A couple of years ago the hurrah over television had many people ready to discard their radio receivers and start seeing pictures in the home. That's all past now. Until further discoveries are made there is no indication that television for the home will be commercially possible. And when it does come, if it comes by radio, it will not only be over a second and separate receiver, but probably over a short wave instrument.

Development has become so settled and logical that we are turning over the entire eighth floor of our new factory building to the studios of WLW, our 50,000 watt broadcasting station, the power department of which is located twenty some miles out of Cincinnati. Broadcasting has been a hobby of mine since I set up my first little transmitter in my own home and was tickled to death if one of the neighbors on the next street phoned in to report he was getting my signals through the ear phones.

Today I receive copies of magazines and newspapers from Germany, Cuba, the Bahamas and South America, all containing WLW program announcements, which we send to them because their readers regularly listen to our station, and want to know in advance what we are going to have.

The new factory, by the way, is the culmination of something we started several years ago, when we took the production line methods of the Detroit automobile factories and applied them to quantity production of radio sets.

Win $2,000
Or Buick Sedan and $505

You can share in great advertising campaign. $4,000 in 50 Prizes including 3 Sedans. Also thousands of dollars in special rewards. Chas. Francis won $1,145; Mrs. Frederick won $1,000; Mrs. Landquist won $955; and scores of others. Now bigger than ever. In our new campaign **someone** wins $2,000—**why not you?** Enter now and

Find 5 Faces in Picture

Strange faces are in tree, clouds etc. Some are upside down, others look straight at you. **If you find 5 or more faces,** mark them, clip the picture and mail. If you answer now, and take an active part, **you are sure to get a special cash reward.** You may win Buick Sedan, and $505 for promptness—or $2,000 if you prefer all cash. Mail answer today.

$505 for Promptness
If you are prompt I'll give $505 extra if you win first prize. Answer today!

Someone answering wins Buick Sedan delivered by nearest dealer. Duplicate prizes in case of final ties. No matter where you live, if you want to win $2,000 first prize **money, send answer today** for details. Can you find 5 or more faces? **Send me money.** S. E. Ferry, Mgr. 850 W. Adams St. Dept. 233, Chicago

Send Today

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Complete instruction book written in plain language called **"HOW TO PAINT SIGNS AND SHO CARDS"** teaches you this money-making trade easily, quickly. No talent or experience required. Earn good money spare or whole time. **EXPLAINS EVERYTHING.** Alphabets, Colors, **HOW TO MIX PAINTS,** Show Card, Window, Board and Wall Signs, Ready-made letters, Gilding, **TRICKS OF THE TRADE,** etc. Contains 100 alphabets and designs. **SPECIAL OFFER: FOUR BALL BEARING SHOW CARD PENS FREE** if ordered at once.

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Just send your name and address. We'll send this remarkable book with pens at once. On arrival pay postman only $2.98 plus small delivery charge. Money back in 5 days if not pleased. **Price outside of U. S. $3.20 Cash with order.**

Globe Publishing Co., Div. 31, Syracuse, N. Y.

What Made His Hair Grow?

Read His Letter for the Answer

"Two years ago I was bald all over the top of my head.

"I felt ashamed for people to see my head. I tried to overcome this but I remained bald until I used Kotalko.

"New hair came almost immediately and kept on growing. In a short time I had a splendid head of hair, which has been perfect ever since—and no return of the baldness."

This statement is by Mr. H. A. Wild. He is but one of those who voluntarily attest Kotalko has stopped falling hair, eliminated dandruff or aided new, luxuriant hair growth.

Women also report new hair growth through KOTALKO. Many testimonials from men and women whose health was undoubtedly good and whose hair roots were not dead.

Is your physical condition equal to theirs? And are your hair roots alive but dormant? If so, they may be stimulated into growing hair through Kotalko, the right sort of invigorant. Sold by busy druggists.

FREE BOX

To prove the efficacy of Kotalko, for men's, women's and children's hair, the producers are giving Proof Boxes.

KOTAL COMPANY, C-974, Station O, New York

Please send me FREE Proof Box of KOTALKO.

Name .....

Full Address .....

.....

SCIENCE FINDS NEW DRUGLESS GLAND STIMULANT

Science has discovered a new method of applying a positive-nature force. The method is wholly different—a tremendous step forward in regaining prostate gland health. Amazing effects produced in thousands of men, many beyond sixty.

"A hundred years ahead of modern medicine," writes a New York physician. Doctors and osteopaths are using and prescribing it. No drugs, medicine, massage or violet rays. Absolutely safe.

Does what Gland Tablets can never do. Directly stimulates prostate gland, often bringing about an amazing improvement within six days! Also frequently tones up entire system, usually routes constipation and piles. Bladder weakness and frequent painful urination relieved in most cases, often as if by magic.

Scientist's FREE Book, "Why Many Men Are Old at Forty," explains these amazing facts. This book is now FREE. No obligation at all. Simply ask for FREE Book.

THE ELECTRO THERMAL CO.,
6227 Morris Ave., Steubenville, Ohio

450 Miles on a Gallon of Gas!

According to a recent article by the president of the world's largest motor research corporation, there is enough energy in a gallon of gasoline if converted 100% in mechanical energy to run a four cylinder car 450 miles.

NEW GAS SAVING INVENTION ASTONISHES CAR OWNERS

A marvelous device, already installed on thousands of cars, has accomplished wonders in utilizing a portion of this waste energy and in producing mileage tests that seem unbelievable. Not only does it save gasoline, but it also creates more power, gives instant starting, quick pick-up, and eliminates carbon.

FREE SAMPLE and $100 a Week

To obtain national distribution quickly, men are being appointed everywhere to help supply the tremendous demand. Free samples furnished to workers. Write today to E. Oliver, Pres., for this free sample and big money making offer.

WHIRLWIND MFG. CO.
999-177-A Third St., Milwaukee, Wis.

Kill This Man!

THERE'S a devil inside of you. He's trying to kill you. Look out for him! He tells you not to work so hard. What's the use? The boss only piles more work on you. He tells you not to bother with your body. If you're weak—you always will be weak. Exercise is just a lot of rot. Do you recognize him? Of course you do. He's in us all. He's a murderer of ambition. He's a liar and a fool. *Kill him!* If you don't he will kill you.

Saved

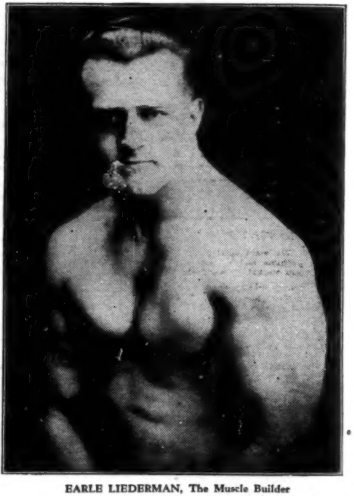
Thank your lucky stars you have another man inside of you. He's the human dynamo. He fills you full of pep and ambition. He keeps you alive—on fire. He urges you on in your daily tasks. He makes you strive for bigger and better things to do. He makes you crave for life and strength. He teaches you that the weak fall by the wayside, but the strong succeed. He shows you that exercise builds live tissue—live tissue is muscle—muscle means strength—strength is power. Power brings success! That's what you want, and gosh darn your old hide! You're going to get it.

Which Man Will It Be?

It's up to you. Set your own future. You want to be the Human Dynamo? Fine! Well, let's get busy. That's where I come in. That's my job. Here's what I'll do for you:

In just 30 days I'll increase your arm one full inch with real live, animated muscle. Yes, and I'll add two inches to your chest in the same time. Pretty good, eh? That's nothing. Now come the works. I'll build up your shoulders. I'll deepen your chest. I'll strengthen your whole body. I'll give you arms and legs like pillars. I'll literally pack muscle up your stomach and down your back. Meanwhile I'll work on those inner muscles surrounding your vital organs. You'll feel the thrill of life shooting up your old backbone and throughout your entire system. You'll feel so full of life you will shout to the world, "I'm a man and I can prove it."

Sounds good, what? But listen! That isn't all. I'm not just promising these things. *I guarantee them!* It's a sure bet. Oh, boy! Let's ride.



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Dear Sir: Please send me, absolutely FREE and without any obligation on my part whatever, a copy of your latest book, "Muscular Development."

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Street .....

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(Please write or print plainly)

What do you think of that? I don't ask one cent. And it's the peppiest piece of reading you ever laid your eyes on. I swear you'll never blink an eyelash till you've turned the last cover. And there's 48 full-page photos of myself and some of my prize-winning pupils. This is the finest art gallery of strong men ever assembled. And every last one of them is shouting my praises. Look them over. If you don't get a kick out of this book, you had better roll over—you're dead. Come on, then. Take out the old pen or pencil and sign your name and address to the coupon. If you haven't a stamp, a postal will do. But snap into it. Do it now. Tomorrow you may forget. Remember, it's something for nothing and no strings attached, no obligation. GRAB IT!

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now! take your place in AVIATION

"EASY TO START"
"FLY YOURSELF"

LET THIS WORLD-WAR FLYER TRAIN YOU AT HOME

Major Robert L. Rockwell stands high in the Aviation history of the World War. He is now devoting himself to helping men get the right start in Aviation. Let him train you for this great new industry and your future in Aviation is assured.

MAJOR ROBERT L. ROCKWELL *Says...*

GET YOUR GROUND SCHOOL INSTRUCTION *AT HOME*

My home-study course is compiled to prepare you in the fundamental knowledge of Aviation necessary to rapid progress. Without leaving your present job or spending a lot of money, you can, in a few short months, complete my home-study course and equip yourself with a solid foundation of Aviation knowledge required before flying, or filling any well-paid ground job.

If You Are Under 48

To take an active part in Aviation, with an idea to a real future ahead of you, you should be under 48 years of age to make your start. If you are under that age just mail the coupon and I will tell you just what I can do to help you get into this fascinating big pay field.

Soloed in 7 Hours

Dear Major: Your excellent advice prevented me from taking up Aviation the wrong way when I wanted to learn flying first. After I had completed your ground course, which thoroughly prepared me in the principles of flight, I was able to solo in 7 hours. I always will be glad to tell anyone that I am a Rockwell trained man.

Sincerely, WM. C. RICKELS.

I'll Help You Get a Good Paying Job

I train men right along for jobs as mechanics, riggers, electricians, welders, plane and motor inspectors, airport operators, radio experts, aerial photographers, transport managers and salesmen. Due to the demand for trained men it is easy for me to give you employment assistance.

Pay FOR YOUR FLYING TRAINING *with your* GROUND JOB EARNINGS

Manager of Big Company

Dear Major:—The main thing about your individual method of instruction is that you not only gave me a thorough knowledge of Aviation, but you also showed me how to capitalize on what I learned. I am now General Manager for International Air Surveys and making three times what I ever earned before. I will always be a booster for your method of training.

FLOYD PROTHERO.

Major R. L. Rockwell, Dayton School of Aviation
Desk D-2 **Dayton, Ohio**

If you have not the ready cash for flying instruction after completing my home study course, I will help you get a job at a hangar where you can pay for your flying instruction out of your ground job earnings. But, whether you pay for your flying instructions or earn it, the important thing is to get started with your preliminary training at once.

Mail Coupon for BIG FREE BOOK

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Dayton School of Aviation,
Desk D-2, Dayton, O.

Dear Major: Please send me your FREE book on AVIATION AND YOUR REMARKABLE TUITION OFFER. I AM NOT OBLIGATED.

Name .....

Address .....

Town ..... State ..... Age .....

Amazingly Easy Way to get into ELECTRICITY

Don't spend your life waiting for $5 raises, in a dull, hopeless job. Now . . . and forever . . . say good-bye to 25 and 35 dollars a week. Let me show you how to qualify for jobs leading to salaries of $50, $60 and up, a week, in Electricity—NOT by correspondence, but by an amazing way to train, RIGHT HERE IN THE GREAT COYNE SHOPS. You become a practical expert in 90 days! Getting into Electricity is far easier than you imagine!

Learn Without Lessons in 90 DAYS

By Actual Work—in the Great Shops of Coyne

Lack of experience—age, or advanced education bars no one. I don't care if you don't know an armature from an air brake—I don't expect you to! I don't care if you're 16 years old or 45—it makes no difference! Don't let lack of money stop you. Most of the men at Coyne have no more money than you have.

Railroad Fare Allowed

I will allow your railroad fare to Chicago, and if you should need part-time work I'll assist you to it. Then, in 12 brief weeks in the great roaring shops of Coyne, I train you as you never dreamed you could be trained . . . on a gigantic outlay of electrical apparatus . . . costing hundreds of thousands of dollars . . . real dynamos, engines, power plants, autos, switchboards, transmitting stations . . . everything from doorbells to farm power and lighting . . . full-sized . . . in full operation every day!

Prepare for Jobs Like These

Here are a few of hundreds of positions open to Coyne trained men. Our free employment bureau gives you lifetime employment service.

Armature Expert up to $100 a Week
Substation Operator $60 a Week and up
Auto Electrician . . $110 a Week
Inventor . . . . Unlimited
Maintenance Engineer up to $100 a Week
Service Station Owner up to $200 a Week
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etc., etc. That's a glimpse of how we make you a master practical electrician in 90 days, teaching you far more than the average ordinary electrician ever knows and fitting you to step into jobs leading to big pay immediately after graduation. Here, in this world-famous *Learn by Doing* school—and nowhere else in the world—can you get this training!

Jobs, Pay, Future

Don't worry about a job, Coyne training settles the job question for life. Demand for Coyne men often exceeds the supply. Our employment bureau gives you a lifetime service. Two weeks after graduation Clyde F. Hart got a position as electrician for the Great Western Railroad at over $100 a week. That's not unusual. We can point to Coyne men making up to $600 a month. $60 a week is only the beginning of your opportunity. You can go into radio, battery, or automotive electrical business for yourself and make up to $15,000 a year.

Get the Facts

Coyne is your one great chance to get into electricity. Every obstacle is removed. This school is 30 years old—Coyne training is tested—proven beyond all doubt—endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book of 150 photographs . . . facts . . . jobs . . . salaries . . . opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. This does not obligate you. So act at once. Just mail coupon.

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Nobooks, no baffling charts . . . all real actual work . . . right here in the great Coyne school . . . building real batteries . . . winding real armatures, operating real motors, dynamos and generators, wiring houses

NOW IN OUR NEW HOME

This is our new fireproof, modern home wherein is installed thousands of dollars' worthof the newest and most modern Electrical equipment of all kinds. Every comfort and convenience has been arranged to make you happy and contented during your training.

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Coyne Electrical School, Dept. 40-53
500 S. Paulina Street, Chicago, Illinois

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